

Sweeney, Margaret E.

1a29

Checking the adequacy of long division  
through trial with fifth and sixth grade children



School of Education

July 26, 1929

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B O S T O N   U N I V E R S I T Y

S C H O O L   O F   E D U C A T I O N

T H E S I S

C H E C K I N G   T H E   A D E Q U A C Y   O F   L O N G   D I V I S I O N   T H R O U G H   T R I A L   W I T H

F I F T H   A N D   S I X T H   G R A D E   C H I L D R E N

Submitted by

MARGARET E SWEENEY

(B. A. Boston University 1926)

In Partial Fulfillment of Requirements for the Degree of  
Master of Education

1929

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MISSISSIPPI

STATE OF

MISSISSIPPI

THE DISTRICT COURT OF THE FIRST JUDICIAL DISTRICT

IN AND FOR THE COUNTY OF

MISSISSIPPI

IN THE MATTER OF

THE ESTATE OF

THE STATE OF MISSISSIPPI

VS.

THE

STATE OF

MISSISSIPPI



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1955

1951

1 \*

2 \*

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11 - 15

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11. Distribution of income in 1955 by type of income and by type of taxpayer. (See Table 1, page 10.)

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\* See gray folio



# TABLE I

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7

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\* See Gray Folio



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C H E C K I N G   o f   M A S T E R Y

O F

L O N G   D I V I S I O N

F I R S T   T R I A L   -   O C T O B E R   1 5 ,   1 9 2 8



1911-12 - 1st Year

70

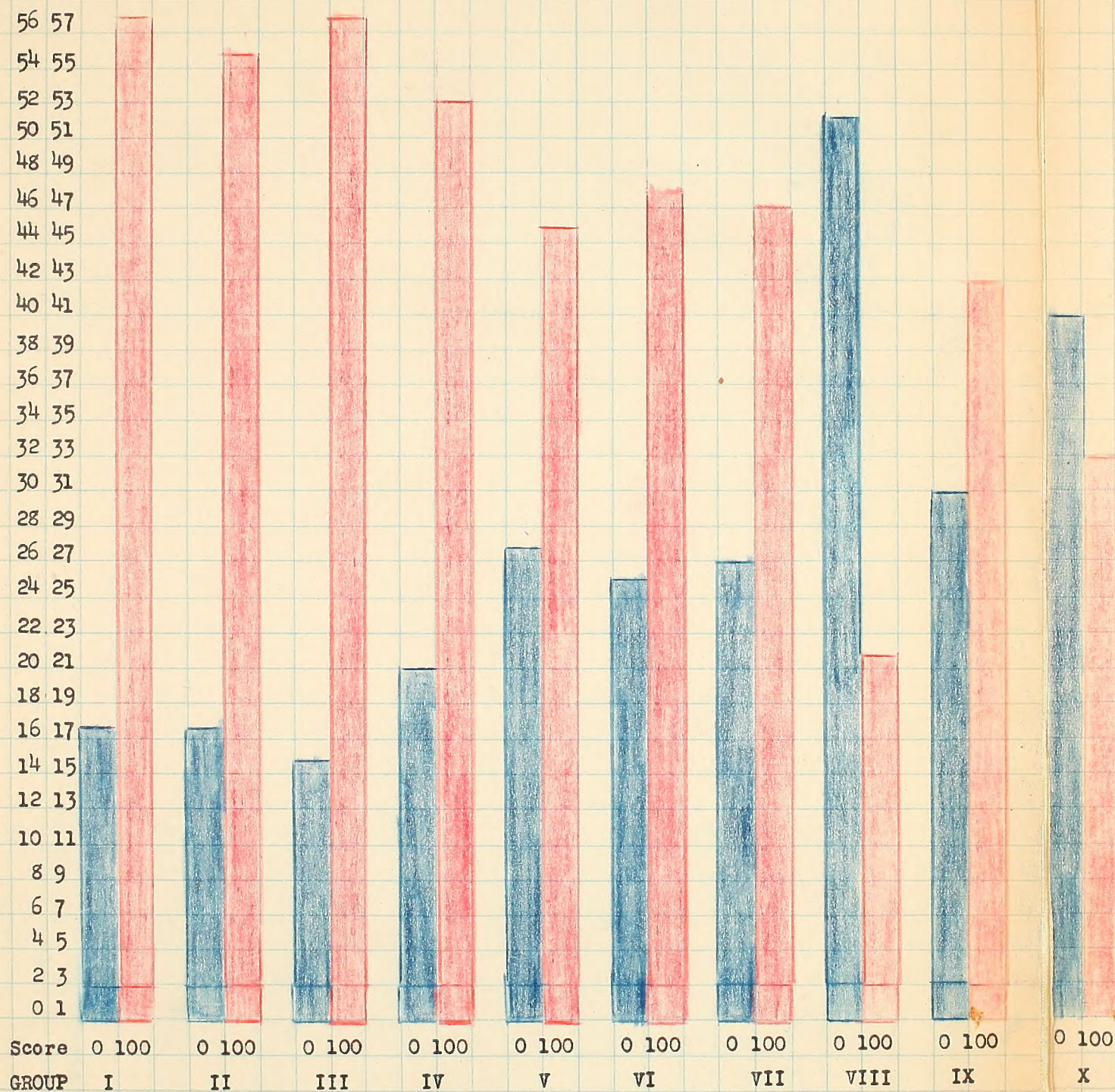
1912-13 - 2nd Year

1913-14 - 3rd Year



## WISSON PROCESS INVENTORY AND DIAGNOSTIC TEST

Distribution of Scores to Show 100% Class efficiency in Long Division  
(Penalty Score Basis)

Test 6 P<sup>2</sup> 70 pupils

Group	1.	Median	100	Mean	77.7
2.	"	100	"	75.0	
3.	"	100	"	77.7	
4.	"	100	"	71.0	
5.	"	100	"	61.1	
6.	"	100	"	63.9	
7.	"	100	"	62.4	
8.	"	0	"	26.9	
9.	"	100	"	56.9	
10.	"	0	"	43.	

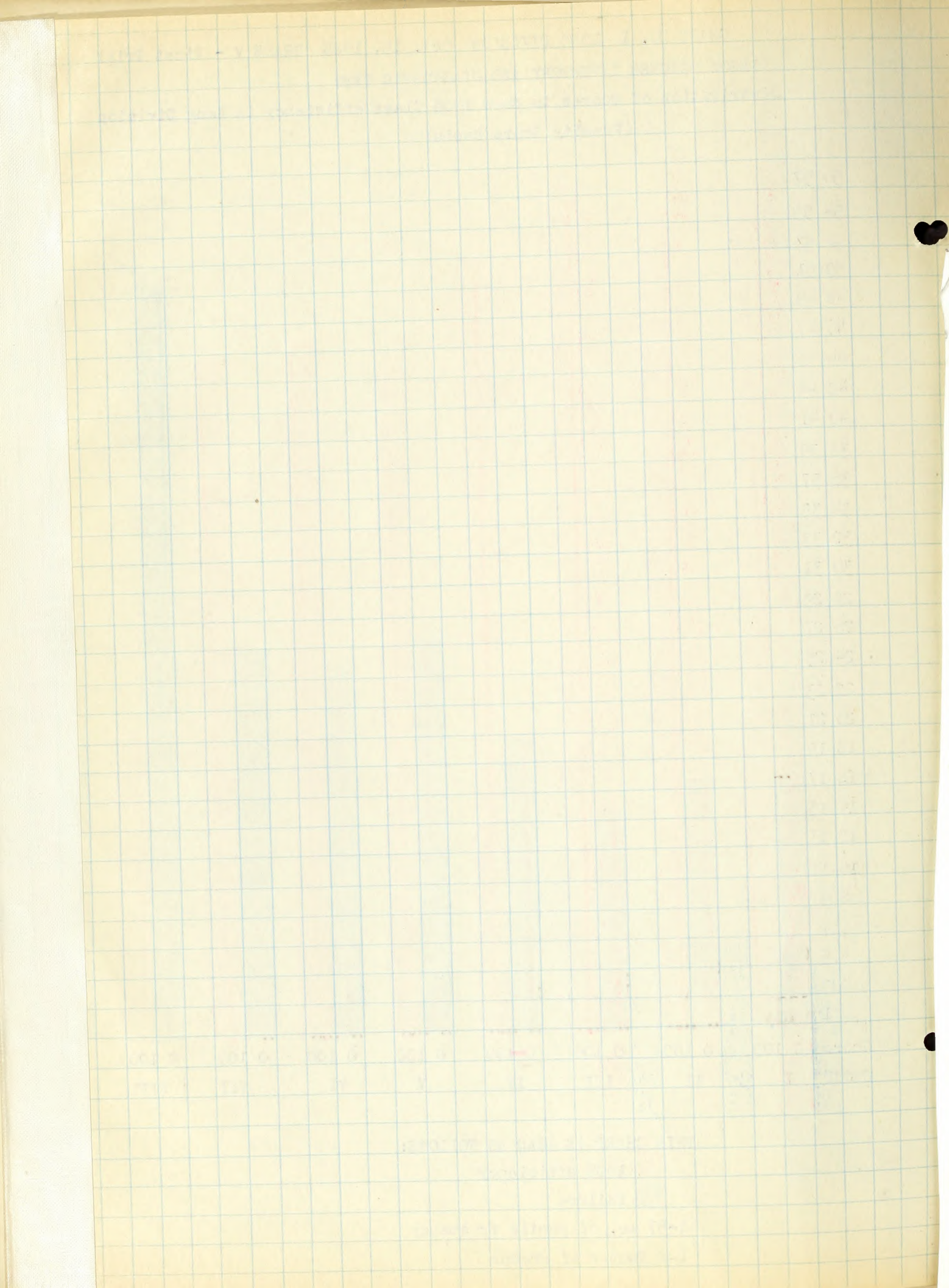
THIS CHART IS READ AS FOLLOWS:

100% efficiency  
failure

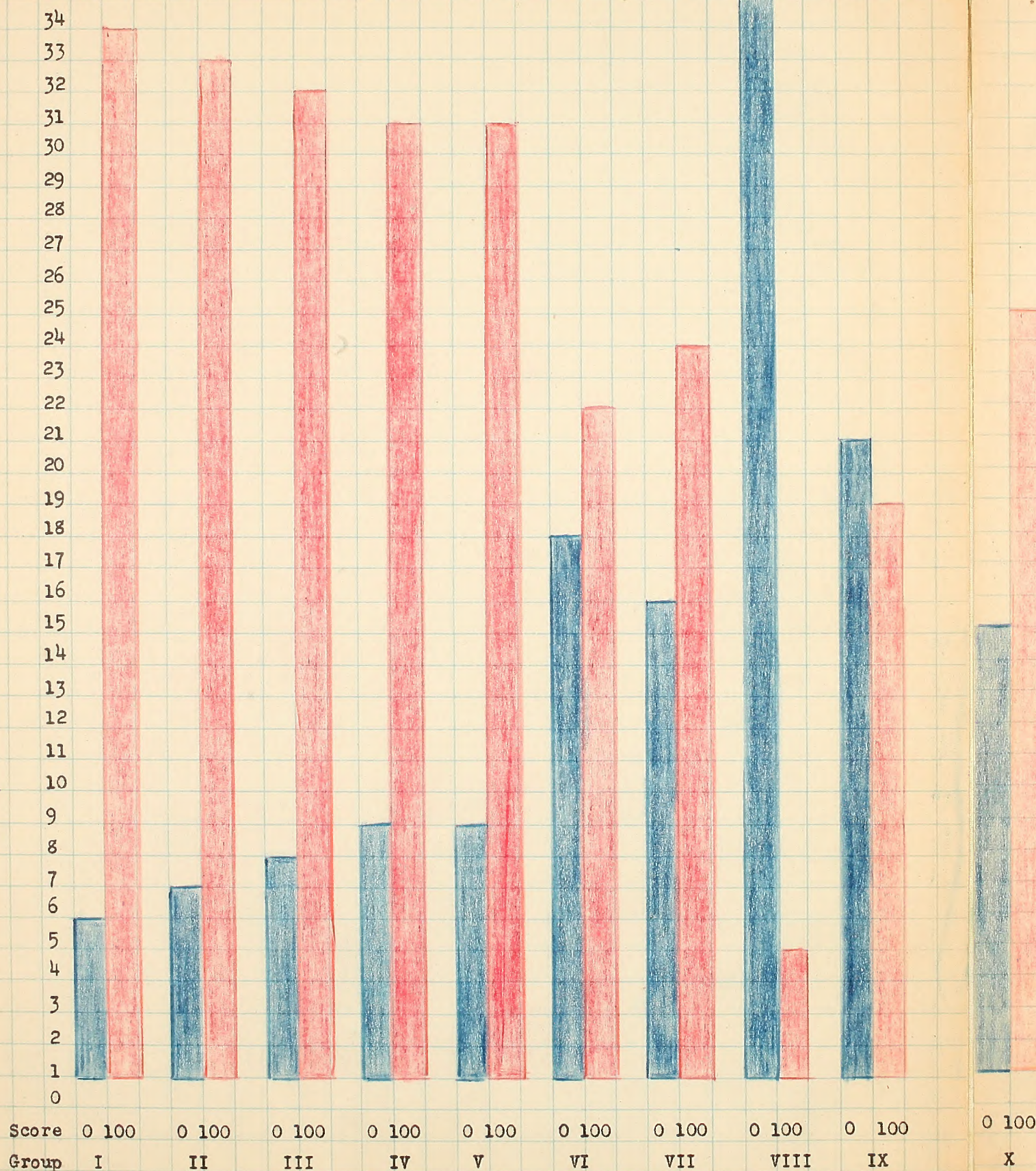
1-57 no. of pupils frequency

I-X Number of groups









THIS CHART IS READ  
 AS FOLLOWS:  
 100% efficiency  
 failure  
 1-34 number frequencies  
 I-X number of group

GROUP 1.	Median	100	Mean	86.1
2.	"	100	"	83.3
3.	"	100	"	80.5
4.	"	100	"	77.7
5.	"	100	"	77.7
6.	"	100	"	52.7
7.	"	100	"	58.3
8.	"	0	"	8.3
9.	"	0	"	47.2
10	"	100	"	58.3





D I S T R I B U T I O N

S H E E T S

( SEE TABLES NO. I - II AND CHARTS NO. 1,2. )



1 2 3 4 5 6 7 8 9

1 2 3 4 5

( 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 )

In order to check the mastery of Long Division in the Fifth and Sixth Grade, Wilsons Process Inventory and Diagnostic Test of Long Division Test 6P<sup>2</sup> was given October 15, 1928.

Grade V had 70 pupils and Grade VI had 38 pupils. They decided to work for 100% efficiency and any child who failed received a score of zero, as the Penalty Score was to be the basis of their work. The Score was 100% or 0%.

Penalty Score was used because the pupil decided that there could be only two scores - 100% or 0%. They were to be 100% efficient or a failure on each test. The Penalty Score acted as a spur to the class to become 100% efficient.

The test was composed of fifty examples divided into ten groups varying in process step difficulties.

The results showed that only one child in Grade V had no errors. (See Distribution Sheet Table No. II and Charts No. 1-2).

41)410 was the only example that all pupils did correctly, while 32)\$177.00 was done incorrectly 62 times. The total number of errors made on the examples in Grade V was 604. Most of the errors were in the subtraction facts.

Any child who failed on one or more examples in a group was considered to have failed in that group. (See Charts No. 1-2 Table No. I-II).

Grade V had a median of 100 in all Groups except Group 8 and 10.

Grade VI had a median of 100 in all Groups except Group 8 and 9.

Most of the errors in Group 8 and 10 in Grade 5 were due to the point difficulty in dollars and cents (See Table II Chart 1-2).

In Grade VI the errors in Group 8 were also due to the point difficulty in dollars and cents. In Group 10 the final zero was omitted.

In Grade VI one pupil had 100% efficiency in this test. The errors







ranged from 1-21 (See Table I. The total number of errors was 222. 32)\$177.00 was done incorrectly twenty-eight (28) times.

21)441, 41)410, 61)1974, 61)5185 were the four examples which were done correctly by all pupils in the class.

These results showed many weaknesses and indicated that the class was in great need of remedial instruction.

#### SUMMARY OF TEST 6P<sup>2</sup> by GRADES

(See Distribution Sheet, Table No. I, Chart No. 1)

Penalty Score as a Basis.

GRADE		MEDIAN OF ERROR	MEAN OF ERROR	CLASS MEAN
V	70	11	17.2	82.8
VI	38	4	11.6	88.4

#### MOST COMMON ERRORS BY GRADES

(See Distribution Sheet Table No. I)

<u>GRADE V</u>	<u>GRADE VI</u>
32)\$177.00	32)\$177.00
26)18460	26)18460
64)32750	64)32750
222)69264	222)69264
74)518370	74)518370
98)9016	98)9016
52)3588	64)3445
70)1740	54)494
45)3555	
14)\$8.40	

#### DIFFERENT EXAMPLES FAILED ON

GRADE V. 1 example had no error

2 different examples failed on once



The first part of the report is devoted to a description of the  
 work done during the year. It is divided into two main sections,  
 one dealing with the general results of the work, and the other  
 with the details of the experiments. The first section is devoted to  
 a description of the general results of the work, and the second  
 to a description of the details of the experiments.

GENERAL RESULTS

Table 1. Results of the experiments.

Experiment	Result
1	1.0
2	1.5
3	2.0
4	2.5
5	3.0
6	3.5
7	4.0
8	4.5
9	5.0
10	5.5

DETAILS OF THE EXPERIMENTS

(The following table gives the details of the experiments.)

Experiment	Result
1	1.0
2	1.5
3	2.0
4	2.5
5	3.0
6	3.5
7	4.0
8	4.5
9	5.0
10	5.5

CONCLUSIONS

The results of the experiments show that the work done during the year  
 has been successful in obtaining the desired results. The work has been  
 carried out in accordance with the plan of the year, and the results  
 obtained are in good agreement with the theoretical predictions.



1 example failed on twice

4 different examples failed on three times

3	"	"	"	"	five	"
4	"	"	"	"	six	"
4	"	"	"	"	seven	"
2	"	"	"	"	eight	"
3	"	"	"	"	nine	"
3	"	"	"	"	eleven	"
1	"	"	"	"	twelve	"
3	"	"	"	"	thirteen	"
2	"	"	"	"	fourteen	"
2	"	"	"	"	sixteen	"
4	"	"	"	"	seventeen	"
1	"	"	"	"	eighteen	"
2	"	"	"	"	nineteen	"
1	"	"	"	"	twenty	"
3	"	"	"	"	twenty-one times	
2	"	"	"	"	twenty-seven times	
1	"	"	"	"	sixty-two	"

#### GRADE VI

4 examples had no errors.

4 different examples failed on once

8	"	"	"	"	two times
9	"	"	"	"	three "
4	"	"	"	"	four "
7	"	"	"	"	five "
6	"	"	"	"	six "
1	"	"	"	"	seven "
3	"	"	"	"	eight "
2	"	"	"	"	nine "





1 example failed on eleven times

1       "       "       "       twenty-eight times

Pupils errors ranged from 1-40 in Grade V and 1-21 in Grade VI.

Score range 20%-100% in Grade V

38%-100% in Grade VI

SUMMARY OF MEAN AND MEDIAN BY GROUPS OF LONG DIVISION TEST 6p<sup>2</sup>

FOR GRADE V AND VI

(See Charts No. 1,2. Table No. I,II)

Basis Used was Penalty Score

GROUP	GRADE V		GRADE VI	
	Median	Mean	Median	Mean
1	100	77.7	100	86.1
2	100	75.0	100	83.3
3	100	77.7	100	80.5
4	100	71.0	100	77.7
5	100	61.0	100	77.7
6	100	63.9	100	52.7
7	100	62.4	100	58.3
8	0	26.9	0	8.3
9	100	56.9	0	47.2
10	0	43.0	100	58.3

1. Sample taken on 10/10/1968

2. Sample taken on 10/10/1968

3. Sample taken on 10/10/1968

4. Sample taken on 10/10/1968

5. Sample taken on 10/10/1968

TABLE 1. SUMMARY OF DATA FOR THE 10/10/1968

TABLE 1. SUMMARY OF DATA FOR THE 10/10/1968

TABLE 1. SUMMARY OF DATA FOR THE 10/10/1968

TABLE 1. SUMMARY OF DATA FOR THE 10/10/1968

DATE	TIME	TEMP	WIND	WAVE	SEA
10/10/68	0800	10.0	10.0	10.0	10.0
10/10/68	0900	10.0	10.0	10.0	10.0
10/10/68	1000	10.0	10.0	10.0	10.0
10/10/68	1100	10.0	10.0	10.0	10.0
10/10/68	1200	10.0	10.0	10.0	10.0
10/10/68	1300	10.0	10.0	10.0	10.0
10/10/68	1400	10.0	10.0	10.0	10.0
10/10/68	1500	10.0	10.0	10.0	10.0
10/10/68	1600	10.0	10.0	10.0	10.0
10/10/68	1700	10.0	10.0	10.0	10.0
10/10/68	1800	10.0	10.0	10.0	10.0
10/10/68	1900	10.0	10.0	10.0	10.0
10/10/68	2000	10.0	10.0	10.0	10.0
10/10/68	2100	10.0	10.0	10.0	10.0
10/10/68	2200	10.0	10.0	10.0	10.0
10/10/68	2300	10.0	10.0	10.0	10.0
10/10/68	2400	10.0	10.0	10.0	10.0
10/10/68	2500	10.0	10.0	10.0	10.0
10/10/68	2600	10.0	10.0	10.0	10.0
10/10/68	2700	10.0	10.0	10.0	10.0
10/10/68	2800	10.0	10.0	10.0	10.0
10/10/68	2900	10.0	10.0	10.0	10.0
10/10/68	3000	10.0	10.0	10.0	10.0



EXAMPLES HAVING FIVE OR MORE ERRORS

IN LONG DIVISION

TEST 6 P<sup>2</sup>

GRADE V and VI

RECEIVED FROM THE CIVIL SERVICE

IN THE DIVISION

Page 2

IT WAS V. 1000



EXAMPLES HAVING FIVE OR MORE ERRORS IN LONG DIVISION TEST 6 P<sup>2</sup>First Trial

(See Table No. I)

GRADE V - 70 pupils32) $\overline{\$177.00}$  failed on 62 times.26) $\overline{18460}$  52) $\overline{3588}$  failed on 27 times70) $\overline{1740}$  74) $\overline{518370}$  45) $\overline{3555}$  failed on 21 times36) $\overline{14840}$  failed on 20 times74) $\overline{274}$  98) $\overline{9016}$  failed on 19 times14) $\overline{\$8.40}$  failed on 18 times121) $\overline{14895}$  failed on 17 times45) $\overline{\$31.50}$  81) $\overline{5508}$  47) $\overline{4360}$  83) $\overline{76360}$  failed on 16 times61) $\overline{5185}$  131) $\overline{2751}$  failed on 15 times64) $\overline{3445}$  66) $\overline{5214}$  failed on 14 times31) $\overline{139996}$  63) $\overline{2374}$  222) $\overline{69264}$  failed on 13 times1122) $\overline{135762}$  failed on 12 times52) $\overline{1198}$  42) $\overline{1008}$  54) $\overline{4914}$  failed on 11 times32) $\overline{1312}$  34) $\overline{2074}$  73) $\overline{2409}$  failed on 9 times28) $\overline{392}$  59) $\overline{1357}$  failed on 8 times21) $\overline{6749}$  32) $\overline{769}$  73) $\overline{3358}$  67) $\overline{2707}$  failed on 7 times31) $\overline{6874}$  47) $\overline{1598}$  91) $\overline{3915}$  failed on 6 times51) $\overline{5693}$  23) $\overline{1196}$  64) $\overline{32750}$  failed on 5 times





EXAMPLES HAVING FOUR OR MORE ERRORS IN LONG DIVISION TEST 6 P<sup>2</sup>

First Trial

(See Table No. II)

GRADE VI - 38 Pupils

32) $\overline{\$177.00}$  failed on 28 times

74) $\overline{518370}$  failed on 11 times

98) $\overline{9016}$  64) $\overline{32750}$  failed on 9 times

26) $\overline{18460}$  222) $\overline{69264}$  64) $\overline{3445}$  failed on 8 times

54) $\overline{4914}$  failed on 7 times

52) $\overline{3588}$  70) $\overline{1740}$  67) $\overline{2707}$  121) $\overline{148951}$  52) $\overline{1198}$  31) $\overline{6874}$  failed on 6 times

66) $\overline{5214}$  45) $\overline{3555}$  83) $\overline{76360}$  36) $\overline{14840}$  1122) $\overline{135762}$  63) $\overline{2394}$  failed on 5 times

14) $\overline{\$8.40}$  73) $\overline{2409}$  45) $\overline{\$31.50}$  failed on 4 times

EXHIBIT A - LIST OF NAMES KNOWN TO HAVE BEEN IN CONTACT WITH THE SUBJECT

First Name

(See Table No. 1)

Table No. 1 - Names

1. [Name] [Address] [City] [State] [Zip]

2. [Name] [Address] [City] [State] [Zip]

3. [Name] [Address] [City] [State] [Zip]

4. [Name] [Address] [City] [State] [Zip]

5. [Name] [Address] [City] [State] [Zip]

6. [Name] [Address] [City] [State] [Zip]

7. [Name] [Address] [City] [State] [Zip]

8. [Name] [Address] [City] [State] [Zip]



D I S T R I B U T I O N   O F   S C O R E S

I N

T H E   W I L S O N   I N V E N T O R Y   A N D   D I A G N O S T I C

T E S T S   I N   A R I T H M E T I C

(SEE CHARTS NO. 3-16)

G R A D E   V   -   V I

TEST 4 A	SUBTRACTION	OCTOBER 1, 1928
TEST 4 B		OCTOBER 2, 1928
TEST 4 C		OCTOBER 3, 1928
TEST 5 A	MULTIPLICATION	OCTOBER 5, 1928
TEST 6 A	DIVISION (SHORT)	OCTOBER 8, 1928
TEST 6 B <sup>1</sup>		OCTOBER 9, 1928
TEST 6 B <sup>2</sup>		OCTOBER 10, 1928





NUMBER OF EXAMPLES IN THE WILSON INVENTORY AND DIAGNOSTIC TESTS

TEST	NUMBER OF EXAMPLES	PROCESS
4A	100	Subtraction
4B	100	Subtraction
4C	200	Subtraction
5A	100	Multiplication
6A	100	Short Division
6B <sup>1</sup>	200	Short Division
6B <sup>2</sup>	<u>200</u>	Short Division
	1,000	

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130	Chapter XIII
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460	Chapter XLVI
470	Chapter XLVII
480	Chapter XLVIII
490	Chapter XLIX
500	Chapter L



CHECKING of MASTERY

OF

SUBTRACTION

SUMMARY

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INFORM TO THE PUBLIC

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## D I S T R I B U T I O N

S H E E T S

(SEE TABLE NO. III, IV. )

THE FIRST

THE SECOND

THE THIRD



During the first and second week of October 1928, the Wilson Inventory and Diagnostic Tests in Subtraction (4A, 4B, 4C) Multiplication (5A) and Division (6A, 6B<sup>1</sup>, 6B<sup>2</sup>) were given to seventy pupils of the fifth grade and thirty-eight pupils of the sixth grade. The children worked for accuracy instead of speed, although each child registered how long it took him to do each test.

The pupils realized that they were working for 100% efficiency in life and it was necessary for them to pass each test before they would be considered 100% efficient.

The tests were corrected and a distribution of errors for each grade was made. This distribution showed the number of errors made by each child, the number of times each combination was incorrect, the number of errors made by the whole class, the number of different examples wrong, the median and mean of errors in each test. (See Distribution Sheet Table No. III, IV).

Graphs were made of each test to show the distribution of scores, frequencies, median of class, mode, quartiles, and mean. Another set of graphs showed the amount of time required to complete each set and the frequencies. (See Graphs)

Before returning tests to the children the corrected form of all errors were placed on the blackboard. Corrected tests were returned to the children. Each child was given a sheet of paper on which he wrote his name, date and title, which was "My Errors in Subtraction, Multiplication and Short Division Tests". After carefully examining the test each pupil registered the corrected form of his error (See Individual's Error Sheet). This sheet was used to check pupil when he was sure he knew the number facts. The children also made "Don't Know Cards." These were flash cards, which had the combination and answer on one side, and the combination without the answer on the other.

Superior children or those who had 100% efficiency were allowed to

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check up on any child who reported that he had completely mastered his number facts, Many of the children took their errors sheets and flash cards home and had their parents help them eradicate their errors.

Individual "Don't Know Cards" drills were given each day for five minutes by the teacher or a pupil. These helped to speed up the responses and enabled the child to pick out the combinations that needed more study.

One set of test errors was corrected at a time, and then the children who had failed were retested. Those who were 100% efficient in the test were allowed to study during the retesting period. The children realized that they were working for 100% efficiency in life, and that it was necessary for them to pass all tests before they would be considered 100% efficient in Arithmetic.

No pupil received 100% in all tests. Every child had some work to do to enable them to be 100% efficient.

No child was to be satisfied with anything less than 100%. Up to date many of the children and parents were pleased and satisfied with the rating from 90% to 100%, but for efficiency the pupils of Grade V and VI decided to have only two scores - namely 100% efficiency or 0%. This was called the penalty score. All the results of the work of these children were rated on the penalty score basis.

After finding out that most of the errors which occurred in the Long Division Test were due to the inefficiency of the class to subtract and multiply, an attempt was made to check the mastery of subtraction through the use of the Wilson Inventory and Diagnostic Test 4A, 4B, 4C.

Test 4A was composed of fifty-five simple operations, each one required no borrowing. Many of these examples were repeated in the test as it contained 100 examples.

In Test 4A Grade VI there were 101 errors. 64 examples had no errors. A child very seldom failed on the same example twice in this test, which





showed that the error was one of carelessness or thoughtlessness on the part of the child. (See Distribution Sheet Table No. III Chart No. 3)

On Table No. III it will be noticed that 25 pupils were 100% efficient, 2 pupils failed on 18 examples, 1 pupil failed on 17 examples, 2 pupils failed on 15 examples. Still closer observation of the table shows that these errors were due to a zero difficulty. This test revealed this weakness and made it possible to direct effort, where it is needed, to the facts not yet mastered.

The examples done incorrectly the greatest number of times were:

8	1	4	9	3	2	6	5	
<u>-0</u>	<u>-0</u>	<u>-0</u>	<u>-0</u>	<u>-0</u>	<u>-0</u>	<u>-0</u>	<u>-0</u>	(See Table No. III)

The Class Median was 100.

The Class Mean was 97.3%

Score range 82-100%.

Before starting the subtraction Test 4B the children of Grade VI and V were urged to work hard, carefully, not to hurry and to have for their aim 100% accuracy within a reasonable time without counting or saying the tables to get the answer.

Test 4B was made up of 100 examples, which contain the 45 combinations that required borrowing. Most of these combinations were repeated. A child seldom failed on the same example twice (See Distribution Sheet Table No. III).

Grade VI in Test 4 B had 32 errors. There were 72 examples that had no errors. 21 pupils were 100% efficient, 1 pupil failed on 4 examples, 1 pupil failed on 5 examples, etc. (See Table No. III and Chart No. 4)

The Class Median was 100%.

The Class Mean was 99.1

Most common errors were:	17	13	10	13
	<u>-8</u>	<u>-7</u>	<u>-4</u>	<u>-6</u>

Score range 95-100

Grade VI with 100% efficiency still its aim attacked the 200 examples in the Subtraction Test 4 C.





The form of setting the examples down impeded the accuracy and speed of the children as they had been trained to use the other form. These examples had remainders as needed for subtraction in Short Division.

In this Test Grade VI, 38 pupils, had 168 errors. 98 different examples had no errors. 10 pupils had no errors.

The pupils errors ranged from 1 to 55. 1 pupil failed on 55 examples, 1 pupil failed on 23 examples, 1 pupil failed on 12 examples etc. (See Distribution Sheet Table No. III Charts No. 5)

The Class Median was 100.

The Class Mean was 98.7

The most common errors were:

54-9, 62-54, 86-81, 89, 81, 32-28, 23-21, 14-8, 55-49, 53-45, 70-63, 70-64, 35-28, 25-21, 55-48.

Score range 73.5 -100%.

In Test 4A Grade V, 70 pupils, had 151 errors. Most of these errors were due to a zero difficulty. There were 50 different examples that had no errors. 4 different examples were failed on 7 times, 9 different examples were failed on 6 times, etc. (See Distribution Sheet Table No IV. Chart No. 6).

39 pupils were 100% efficient. 4 pupils failed on 18 examples, 1 pupil failed on 16 examples, 1 pupil failed on 14 examples, etc. (See Table No. )

Class Median was 100.

Class Mean was 98.7 .

Most Common errors;

1	5	4	3	8	1	7	6	2	9
-1	-0	-0	-0	-0	-0	-0	-0	-0	-0

Score Range 87-100%.

In Test 4 B Grade V had 127 errors. 25 different examples had no errors. 3 different examples were failed on 4 times, 9 examples were failed on 3 times (See Distribution Sheet Table No IV. Chart No. 7)

The first of writing the book was done in the summer of 1950. It was a long and hard job, but I was able to complete it in time. The book was then published in 1951. It was a great success, and I was very happy to see it in print. I had written it for a long time, and I was glad to see it finally published. It was a great achievement for me, and I was proud of it. I had written it for a long time, and I was glad to see it finally published. It was a great achievement for me, and I was proud of it.

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26 pupils were 100% efficient. 1 pupil failed on 20 examples, 1 failed on 10 examples, etc. (See Table No. IV. Chart No. 7)

The Class Median was 99.

The Class Mean was 98.1 .

Most Common errors were:	12	11	11
	<u>-5</u>	<u>-8</u>	<u>-4</u>

Score Range 81-100%.

In Test 4 C Grade V, had 337 errors. 1 example 78-72 was failed on 20 times. 55 different examples had no errors. 15 pupils were 100% efficient. 1 pupil failed on 20 examples, 1 pupil failed on 18 examples, 1 pupil failed on 17 examples, 1 pupil failed on 16 examples. (See Table No. IV. Chart No. 8)

The Class Median was 96.3

The Class Mean was 98 .

The most Common Errors were: 78-72, 44-36, 43-36, 33-27, 71-63, 47-42, 23-16.

Score Range 71-5 - 100%.

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SUBTRACTION CHARTS OCTOBER 1 - 3, 1928

WILSON INVENTORY AND DIAGNOSTIC

TEST

TEST 4 A

TEST 4 B

TEST 4 C

GRADE V - 70 Pupils

GRADE VI- 38 Pupils

(See Charts No. 3-8)





## SUBTRACTION

OCT. 1, 1928

## WILSON INVENTORY AND DIAGNOSTIC TEST 4A

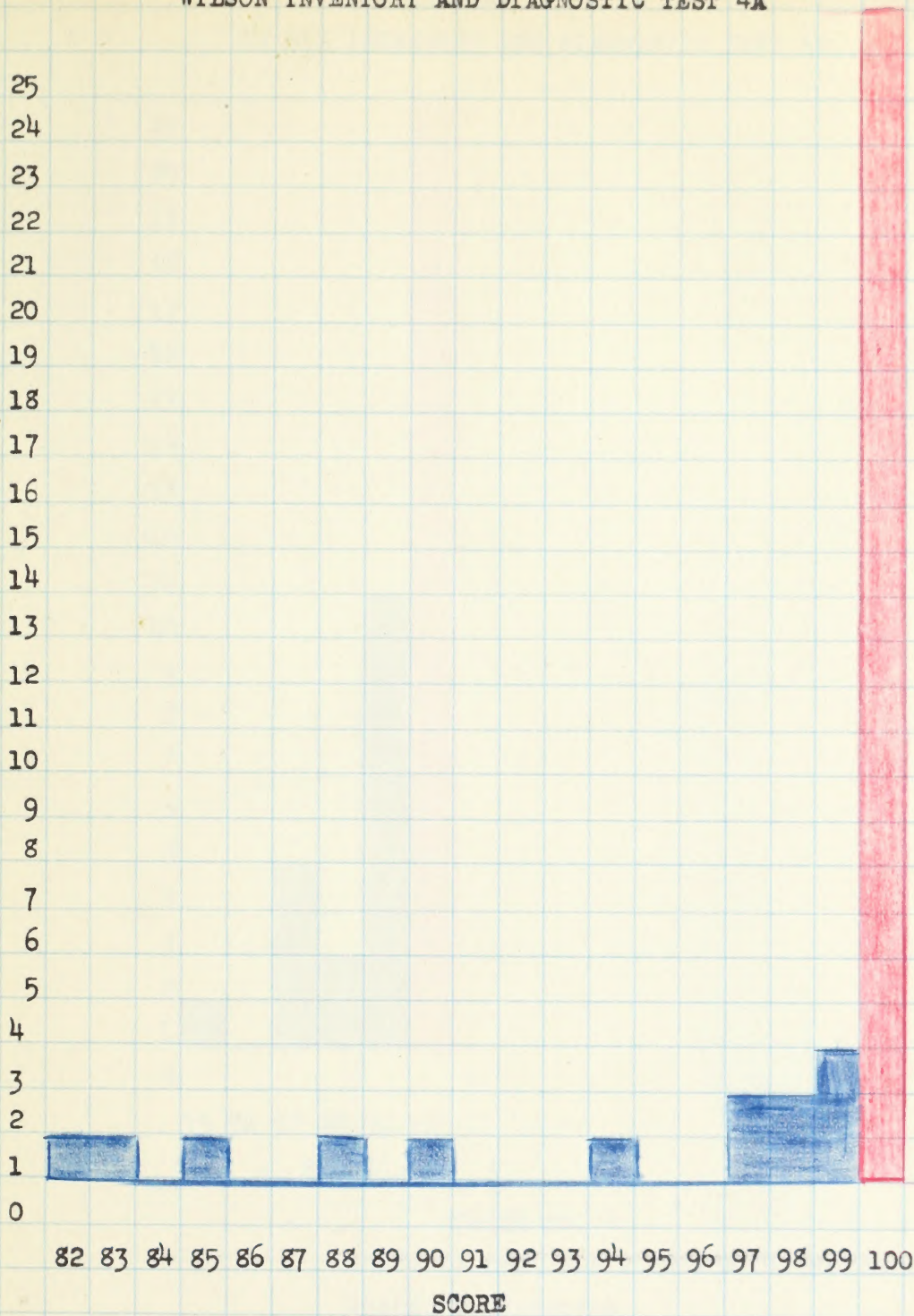


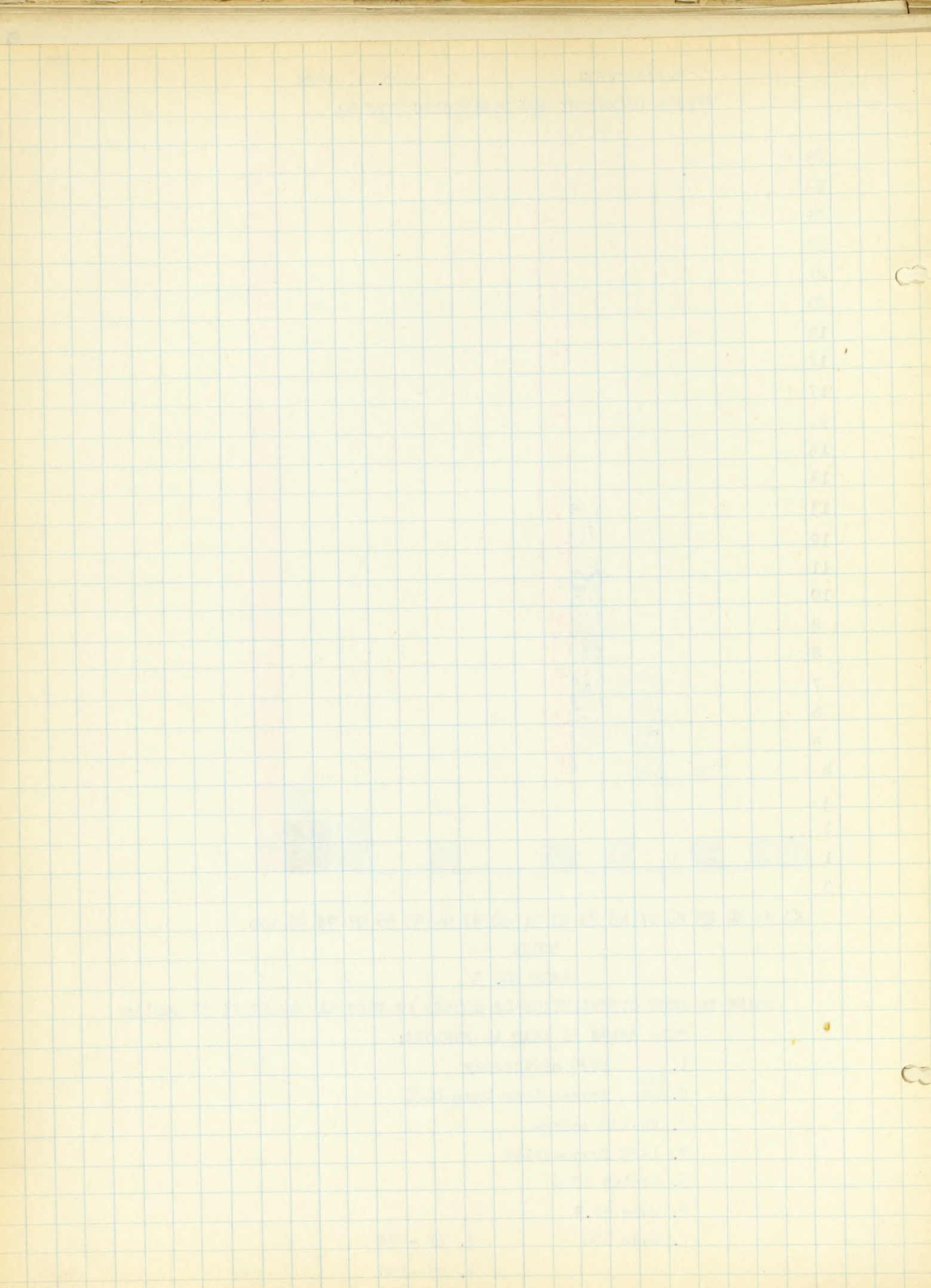
CHART NO. 3

GRAPH TO SHOW DISTRIBUTION OF SCORES IN TEST 4A GRADE VI 38 pupils

THIS GRAPH IS READ AS FOLLOWS:

1. ■ 100% efficiency
2. ■ Scores less than 100%
3. 82-100 scores
4. 1-25 frequencies
5. Median 100%
6. Mean 97.3
7. Mode 100
8. Q1 - 98
9. Q3 - 100







SUBTRACTION Oct. 2, 1928  
 WILSON INVENTORY AND DIAGNOSTIC TEST 4B

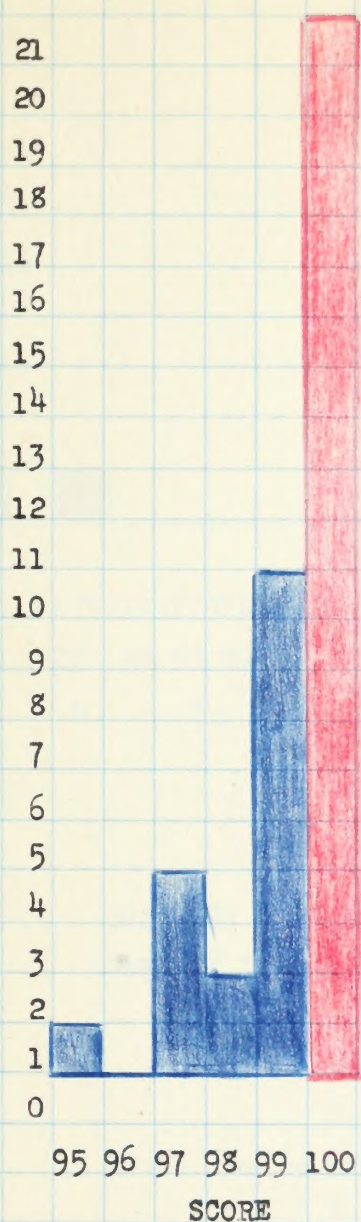


CHART NO. 4

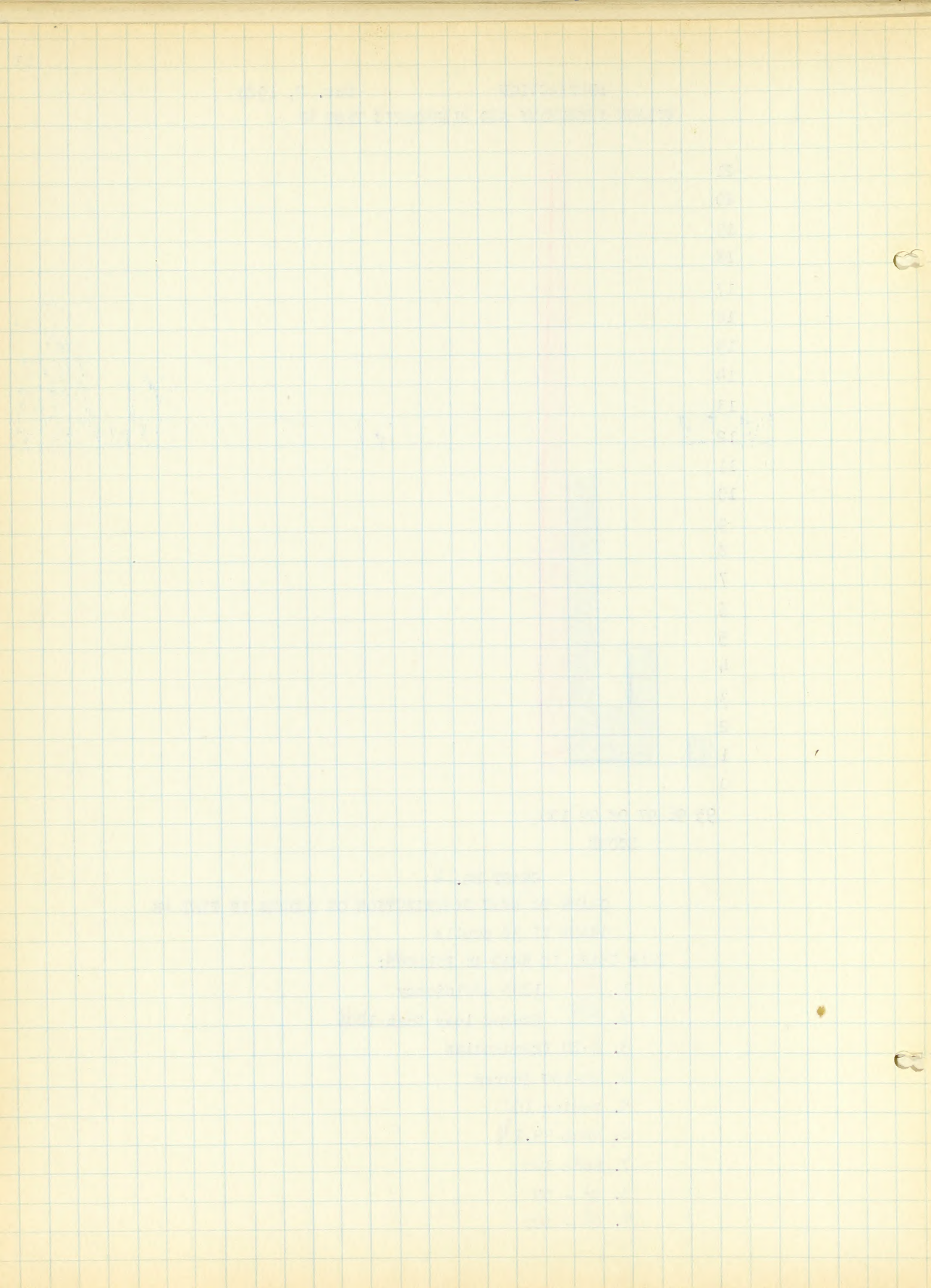
GRAPH TO SHOW DISTRIBUTION OF SCORES IN TEST 4B

GRADE VI 38 pupils

THIS CHART IS READ AS FOLLOWS:

1. ■ 100% efficiency
2. ■ Scores less than 100%
3. 0-20 frequencies
4. 95-100 Scores
5. Median 100
6. Mean 99.1
7. Mode 100
8.  $Q^1$  - 99
9.  $Q^3$  - 100







## WILSON INVENTORY AND DIAGNOSTIC TEST 4C

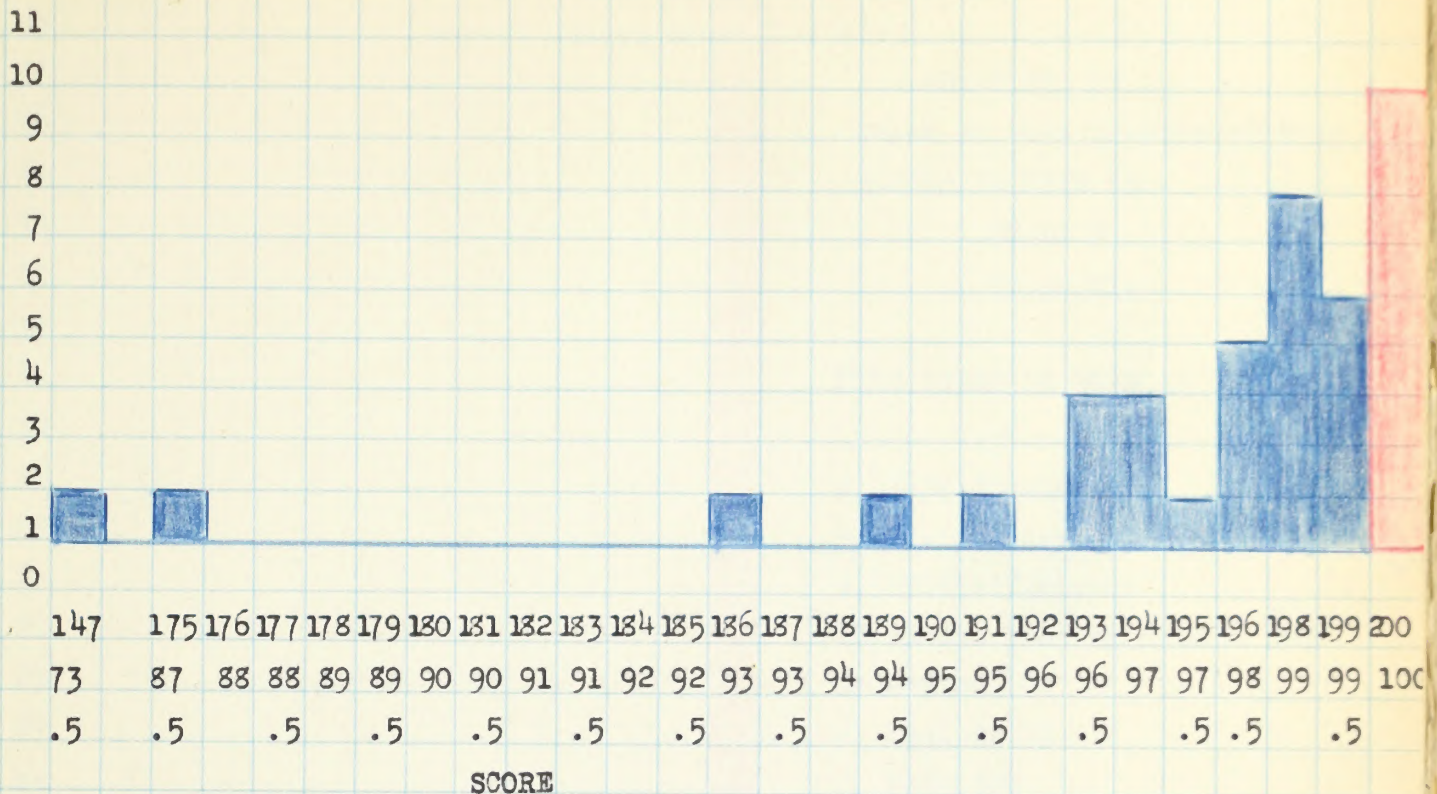


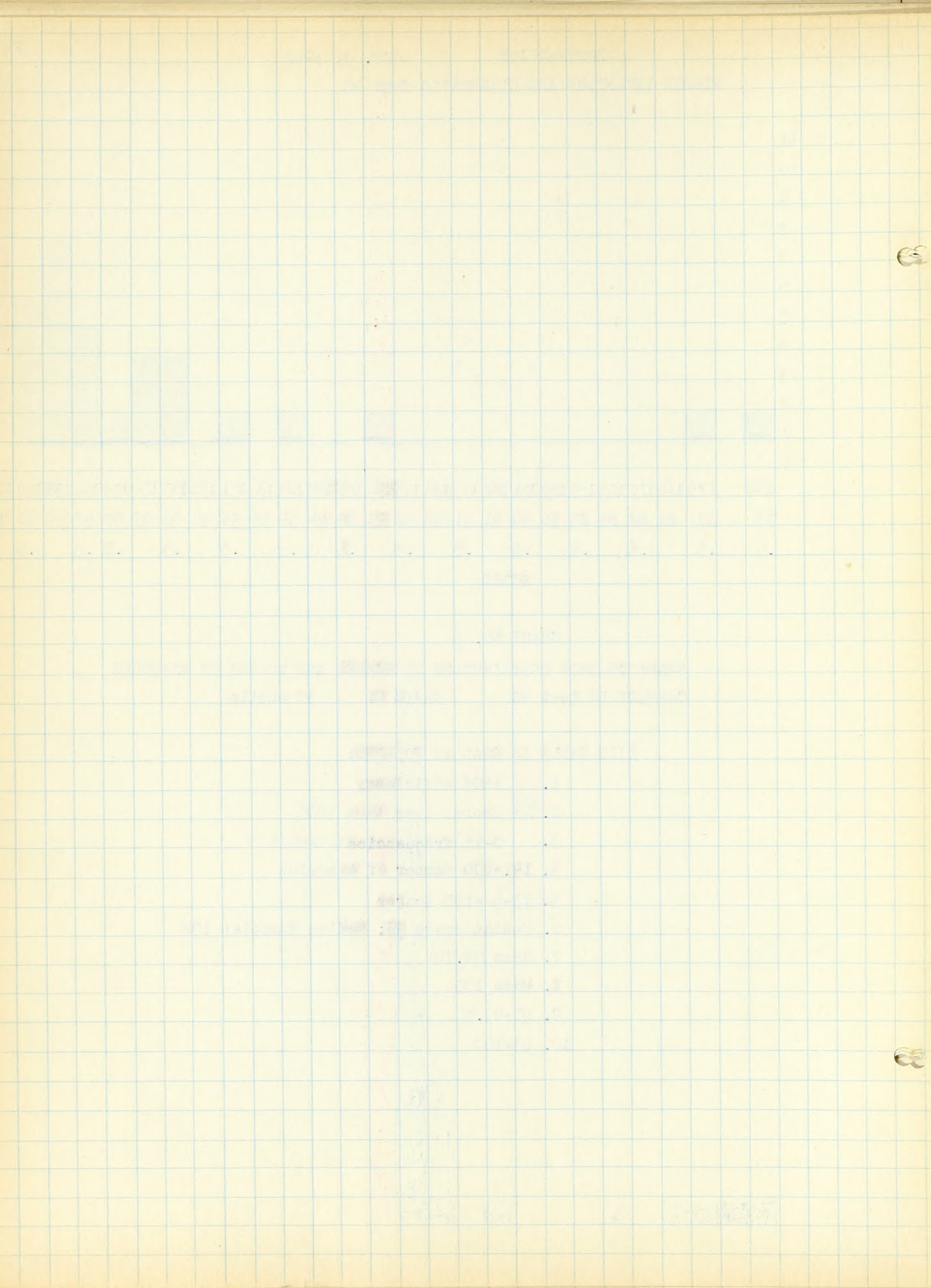
CHART NO. 5

GRAPH TO SHOW DISTRIBUTION OF SCORES AND NUMBER OF EXAMPLES  
CORRECT IN Test 4C GRADE VI 38 pupils

THIS TABLE IS READ AS FOLLOWS:

1. 100% efficiency
2. Scores less than 100%
3. 0-11 frequencies
4. 147-200 Number of examples
5. 73-5 -100 Scores
6. Median Score 99; Median Examples 198
7. Mean 98.7
8. Mode 100
9. Q1-97.5
10. Q3-100





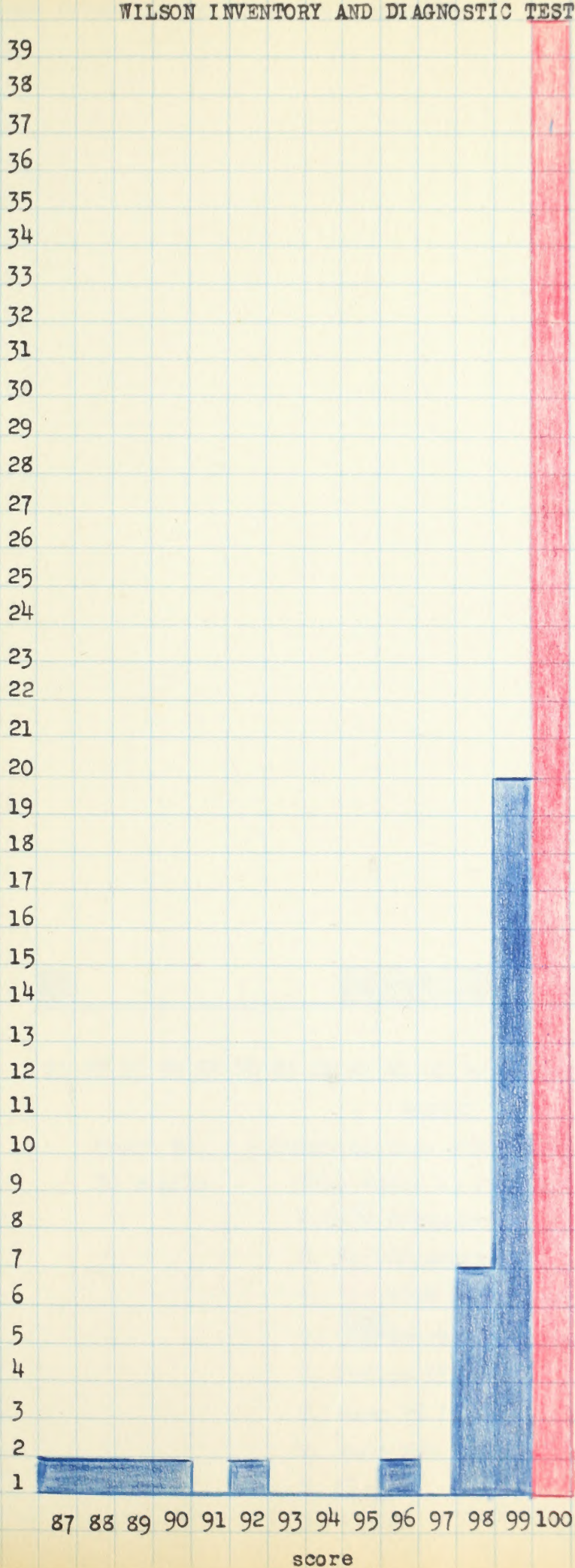


SUBTRACTION                      OCT. 1, 1928  
WILSON INVENTORY AND DIAGNOSTIC TEST 4A

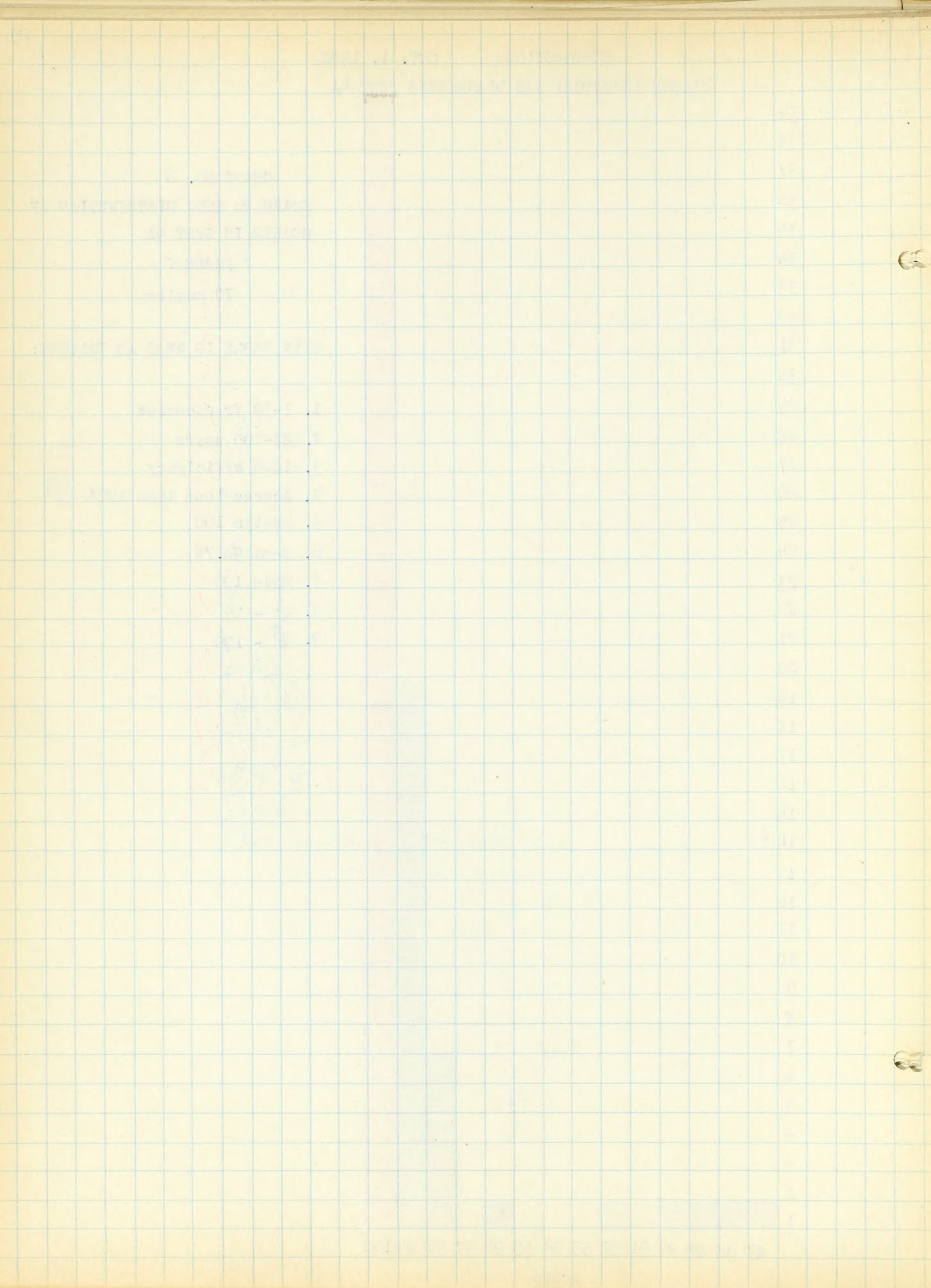
CHART NO. 6  
GRAPH TO SHOW DISTRIBUTION OF  
SCORES IN TEST 4A  
GRADE V  
70 pupils

THIS TABLE IS READ AS FOLLOWS:

- 1. 1-39 frequencies
- 2. 87-100 score
- 3. 100% efficiency
- 4. Scores less than 100%
- 5. Median 100
- 6. Mean 98.7%
- 7. Mode 100
- 8.  $Q^1$  - 99
- 9.  $Q^3$  - 100









## WILSON INVENTORY AND DIAGNOSTIC TEST 4B

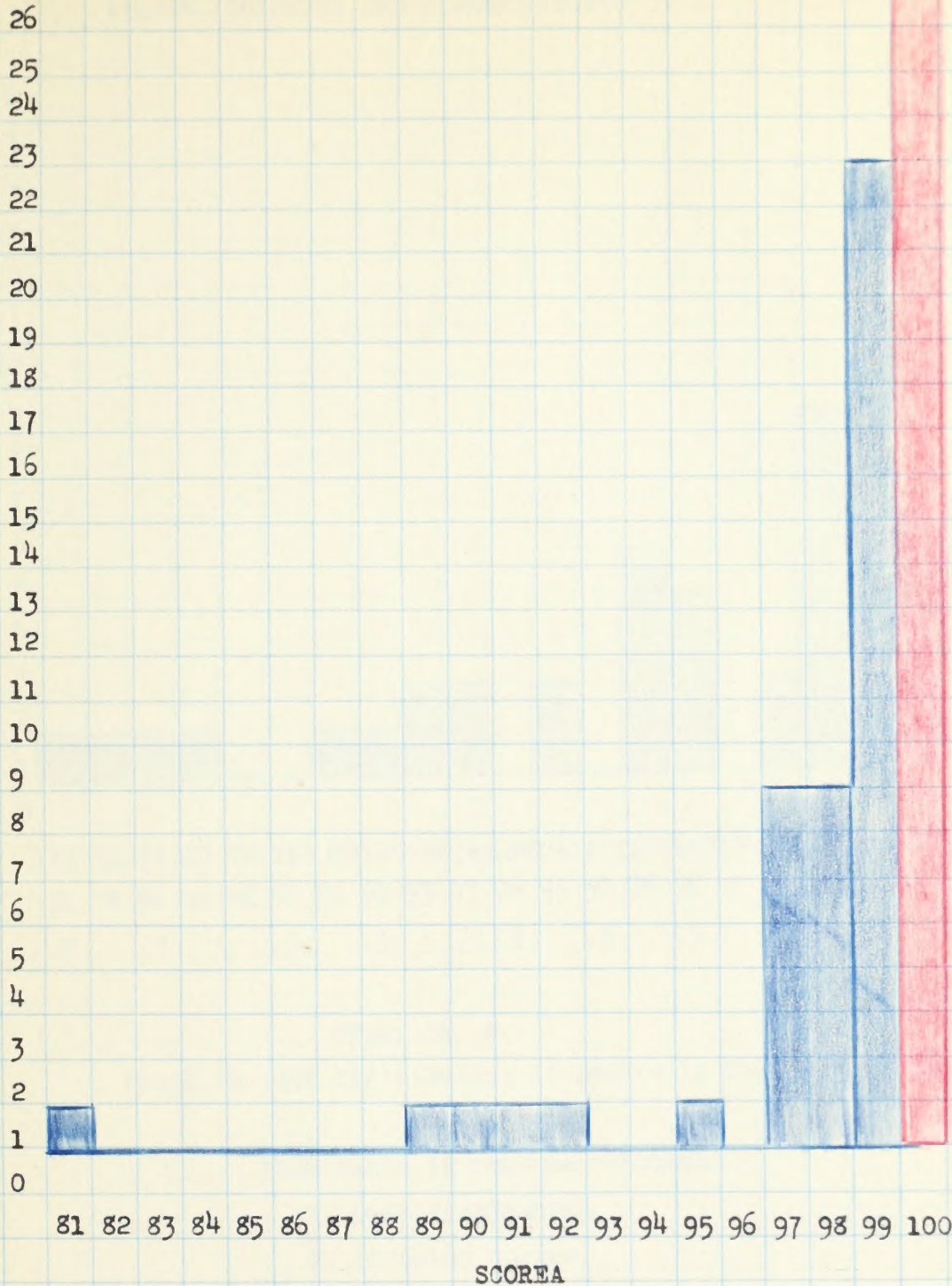


Chart No. 7 - Graph to show distribution of Scores in Test 4B GRADE V  
70 pupils

This table is read as follows:

1. 0-26 frequencies
2. 81-100 scores
3. 100% efficiency
4. Scores less than 100%
5. Median 99
6. Mean 98.1
7. Mode 100
8. Q1-98
9. Q3-100







## SUBTRACTION

OCT. 3, 1928

## WILSON INVENTORY AND DIAGNOSTIC TEST 4 C

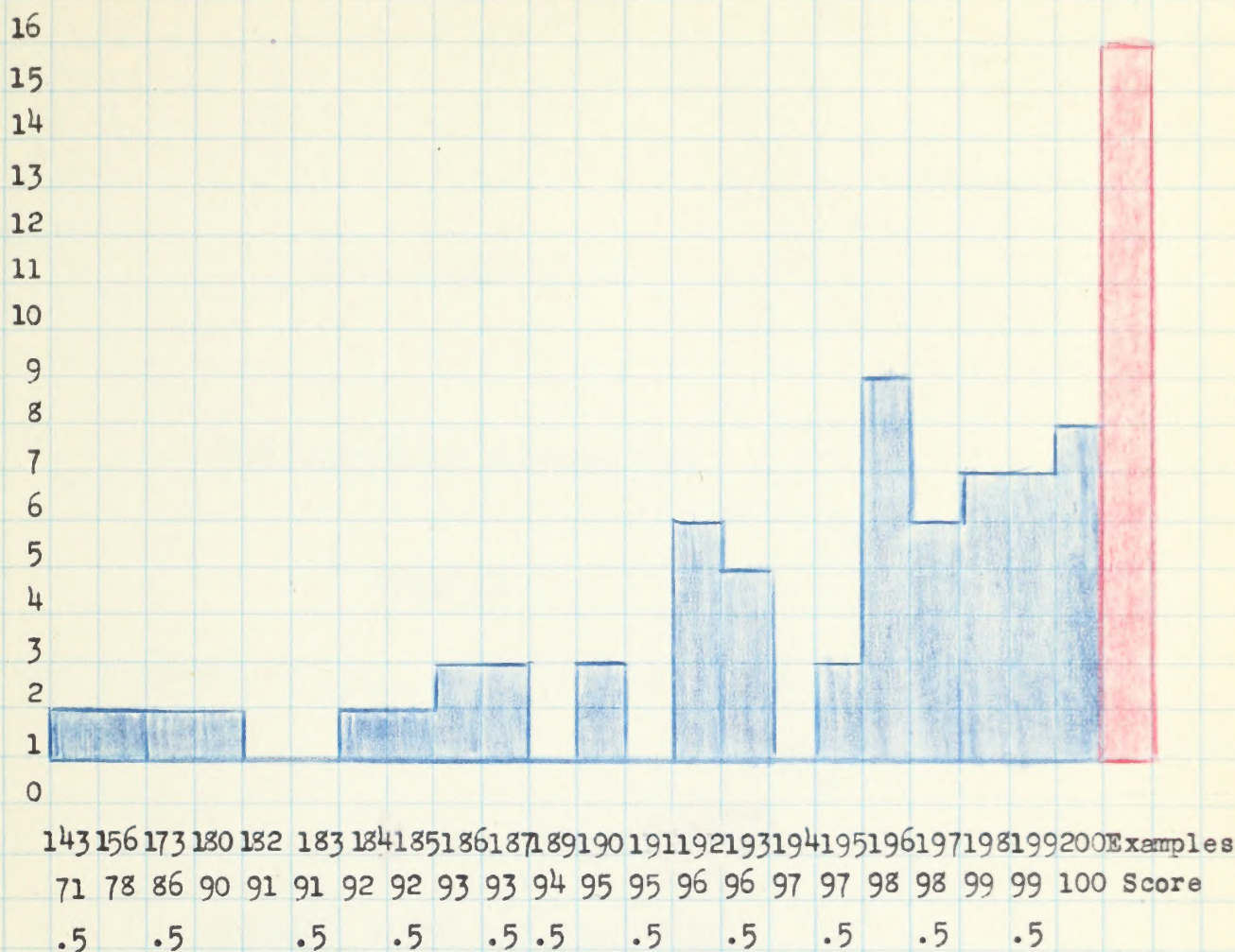


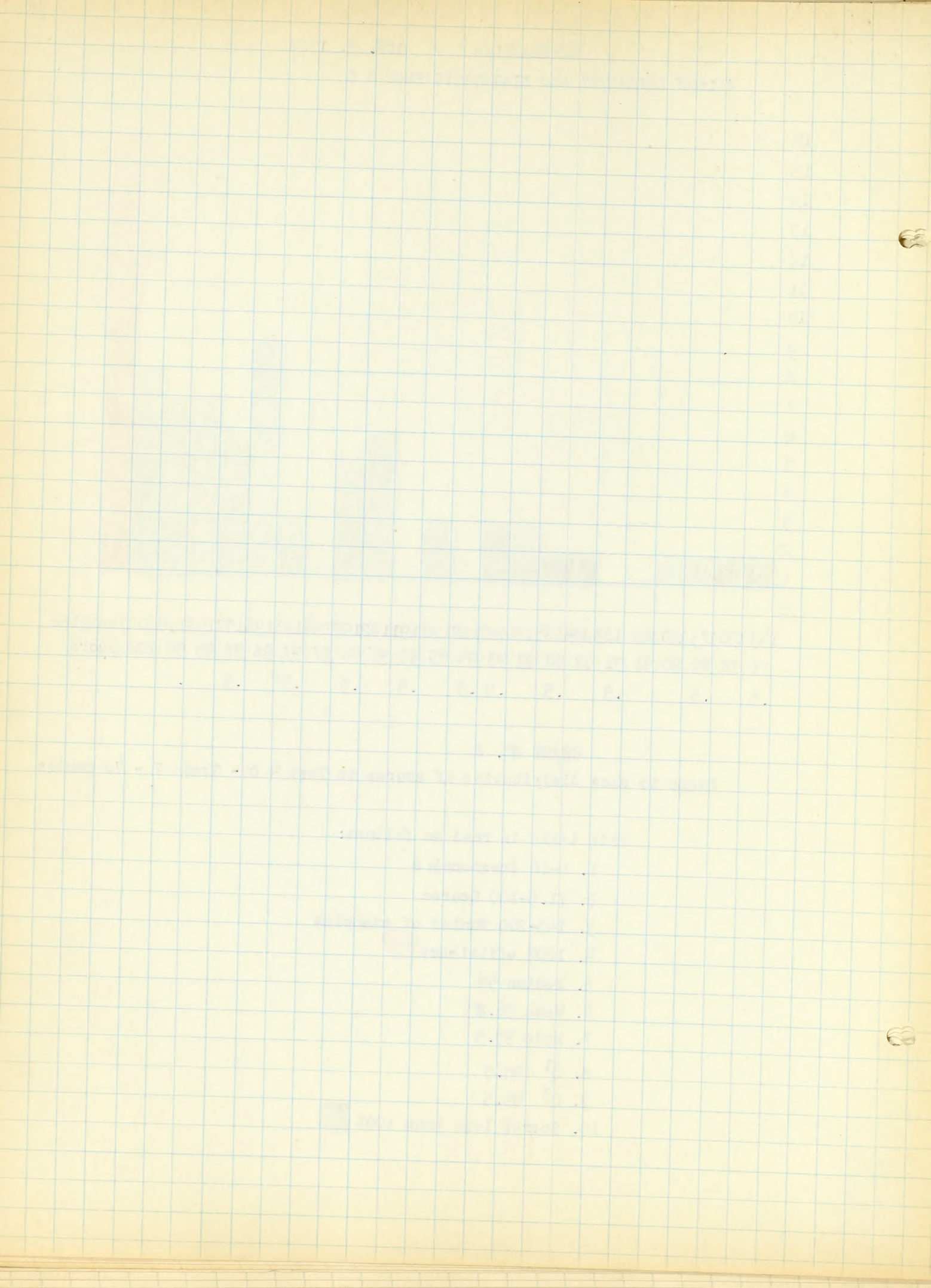
CHART NO. 8

Graph to show distribution of scores in Test 4 C - Grade V - 70 pupils

This table is read as follows:

1. 0-16 frequencies
2. 71.5-100 Scores
3. 143-200 Number of examples
4. 100% efficiency
5. Median 98
6. Mean 96.3
7. Mode 99.5
8.  $Q^1$  95.5
9.  $Q^3$  99.5
10. Scores less than 100%







S U M M A R Y

CHECKING MASTERY OF SUBTRACTION

GRADE VI

(See Distribution of Errors Table No. III and Charts No. 3, 4, 5.)

CHECKING MASTERY OF SUBTRACTION

GRADE V

(See Distribution of Errors Table No. IV and Charts No. 6, 7, 8.)





GRADE VITest 4A

Mean of errors 2.7

Median of errors 3.

38 pupils

101 errors

100 examples

Most Common Errors

8	4	9	3	2	6	5	1
-0	-0	-0	-0	-0	-0	-0	-0

Different Examples Failed

18 different examples failed on once

2	"	"	"	twice
6	"	"	"	four times
7	"	"	"	five times
3	"	"	"	six times

64 no errors.

36 errors.

Errors per pupil

4 pupils failed on 1 example

1	"	"	"	2 examples
2	"	"	"	3 "
1	"	"	"	6 "
2	"	"	"	15 "
1	"	"	"	17 "
2	"	"	"	18 "

25 pupils no errors

13 errors.





SUMMARY CHECKING MASTERY OF SUBTRACTIONGRADE VITest 4 B

Mean of errors .8

Median of errors 1

38 pupils

100 examples.

32 errors

Most Common Errors

17	13	10	13
<u>-8</u>	<u>-7</u>	<u>-4</u>	<u>-6</u>

Different examples failed on

24 different examples failed on once

4	"	"	"	twice
---	---	---	---	-------

72 examples - no errors.

Errors per pupil

10 pupils failed on 1 example

2	"	"	"	2 examples
---	---	---	---	------------

3	"	"	"	3	"
---	---	---	---	---	---

1	"	"	"	4	"
---	---	---	---	---	---

1	"	"	"	5	"
---	---	---	---	---	---

21 pupils - no error

1912

1913

1914

1915

1916

1917

1918

1919

1920

1921

1922

1923

1924

1925

1926

1927

1928

1929

1930

1931

1932



SUMMARY CHECKING MASTERY OF SUBTRACTIONGRADE VITest 4 C

Mean of errors 2.2

Median of errors 2

38 pupils

200 examples

168 errors.

Most Common Errors

54-9, 62-54, 86-81, 89-81, 32-28, 23-21, 14-8, 55-49,

53-45, 70-63, 70-64, 35-28, 25-21

Different Examples failed on

58 different examples failed on once

28 " " " " twice

10 " " " " three times

6 " " " " four times

98 examples no errors - 49%

Errors per pupil

4 pupils failed on 1 example

6 " " " 2 examples

5 " " " 3 "

4 " " " 4 "

5 " " " 5 "

1 " " " 6 "

1 " " " 12 "

1 " " " 23 "

1 " " " 55 "

10 pupils no errors





EXAMPLES HAVING TWO OR MORE ERRORS IN SUBTRACTION BY TESTS

(See Table No. IV)

GRADE VITest 4 A

$$\begin{array}{r} 3 \quad 6 \quad 2 \quad 5 \\ -0 \quad -0 \quad -0 \quad -0 \end{array} \text{ failed on 9 times}$$

$$\begin{array}{r} 4 \quad 1 \quad 9 \\ -0 \quad -0 \quad -0 \end{array} \text{ failed on 10 times}$$

$$\begin{array}{r} 8 \\ -0 \end{array} \text{ failed on 13 times}$$
Test 4 B

$$\begin{array}{r} 17 \quad 13 \quad 13 \quad 10 \\ -8 \quad -7 \quad -6 \quad -4 \end{array} \text{ failed on twice}$$
Test 4 C

36-35 53-45 55-49 14-8 55-48 70-64 52-49 25-18 32-28

70-63 failed on 3 times

48-42 62-54 86-81 89-81 15-8 51-48 failed on 4 times





GRADE VTest 4 A

Mean of Errors 2.1

Median of Errors 3

70 pupils	<u>151</u>
	7000

100 examples

151 errors.

Most Common Errors

1	5	4	3	8	1	7	6	2	9
<u>-1</u>	<u>-0</u>	<u>-0</u>	<u>-0</u>	<u>-0</u>	<u>-0</u>	<u>-0</u>	<u>-0</u>	<u>-0</u>	<u>-0</u>

22 different examples - failed on once

7	"	"	"	"	twice
3	"	"	"	"	three times
1	"	"	"	"	four times
4	"	"	"	"	five times
9	"	"	"	"	six times
4	"	"	"	"	seven times

50 different examples no errors.

Errors per pupil

39 pupils no errors

17 pupils failed on 1 example

5 pupils failed on 2 examples

1 pupil failed on 4 examples

1 " " " 8 "

1 " " " 10 "

1 " " " 14 "

1 " " " 16 "

4 pupils " " 18 "

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SUMMARY CHECKING MASTERY OF SUBTRACTIONGRADE VTest 4 B

Mean of Errors 1.8

Median of errors. 1.

70 pupils  $\frac{127}{7000}$ 

100 examples

127 errors

Most Common Errors

12	11	11
<u>-5</u>	<u>-8</u>	<u>-4</u>

Different Examples Failed On

38 different examples failed on once

25 " " " " twice

9 " " " " three times

3 " " " " four times

25 examples no errors - 25% no errors - 75% of errors.

Errors per pupil

21 pupils failed on 1 example

5 " " 2 "

9 " " 3 "

1 " " 4,5,6,7,8,9,10,11,20 examples.

26 pupils no errors





GRADE VTest 4 C

Mean of Errors 4.8

Median of Errors 2.

70 pupils	<u>337</u>
	1400

200 examples

337 errors.

Most Common Errors

78-72, 44-36, 43-36, 33-27, 71-63, 47-42, 23-16.

Different Examples Failed on

59 different examples failed on once

40	"	"	"	twice
19	"	"	"	three times
18	"	"	"	four times
2	"	"	"	five times
1	"	"	"	six times
3	"	"	"	seven times
2	"	"	"	eight times
1	"	"	"	twenty times

55 examples no errors.

Errors per pupil

12 pupils failed on 1 example

8	"	"	2 examples
7	"	"	3 "
4	"	"	4 "
6	"	"	5 "
1 pupil	"	"	7 "
3 pupils	"	"	8 "
4 pupils	"	"	9 "





## GRADE V - Test 4 C Continued

1 pupil failed on 10 examples

1 " " 12 "

2 " " 14 "

2 pupils " 14 "

2 " " 15 "

1 " " 16 "

1 " " 17 "

1 " " 18 "

1 " " 20 "

15 no errors.





EXAMPLES HAVING TWO OR MORE ERRORS IN SUBTRACTION BY TESTS

(See Table No. III)

GRADE V - 70 pupilsTest 4A

7  
 $\underline{-0}$  failed on 13 times

3 8  
 $\underline{-0}$   $\underline{-0}$  failed on 12 times

9 6 1 4 5  
 $\underline{-0}$   $\underline{-0}$   $\underline{-0}$   $\underline{-0}$   $\underline{-0}$  failed on 11 times

2 1  
 $\underline{-0}$   $\underline{-1}$  failed on 7 times

Test 4 B

11 11 10 12 12 13 13 14  
 $\underline{-7}$   $\underline{-3}$   $\underline{-2}$   $\underline{-3}$   $\underline{-8}$   $\underline{-7}$   $\underline{-8}$   $\underline{-8}$  failed on 3 times

12 11 11  
 $\underline{-5}$   $\underline{-4}$   $\underline{-8}$  failed on 4 times

Test 4 C

60-48 44-42 68-64 69-63 67-63 22-18 46-42 32-28 70-63  
 69-64 41-36 24-18 24-20 42-36 20-14 55-49 54-45 failed on

3 times

54-49 71-64 60-56 70-64 31-27 30-24 31-24 35-27 54-48

62-56 53-49 80-72 62-54 34-27 61-54 53-45 41-35 79-72

55-44 failed on 4 times

61-56 19-16 failed on 5 times

23-16 failed on 6 times

47-42 43-36 44-36 failed on 7 times

71-63 33-27 failed on 8 times

78-72 failed on 20 times





# CHECKING OF MASTERY

OF

## MULTIPLICATION

### SUMMARY

CHAPTER 1

1

CHAPTER 2

CHAPTER 3



On the completion of the Subtraction Tests, the Class Grade VI, 38 pupils, with 100% accuracy as their aim did Test 5A of Multiplication, which contained the 100 combinations up to  $9 \times 9$ .

Results showed 86 errors. 57 examples had no error. Most of the errors were traced to a zero difficulty. 15 pupils were 100% efficient. 1 pupil failed on 12 examples, 1 pupil failed on 10 examples, etc. (See Distribution Sheet Table No. III Chart No. 9)

The Class Median was 99

The Class Mean was 94.7 .

The Most Common Errors were:

7	5	2	0	0	1	9	0	0
<u>x0</u>	<u>x0</u>	<u>x0</u>	<u>x6</u>	<u>x5</u>	<u>x0</u>	<u>x0</u>	<u>x8</u>	<u>x7</u>

Score Range 75-100%.

In Grade V, with 70 pupils, there were 166 errors (See Distribution Sheet Table No. II Chart No. 10). 35 different examples had no errors. 5 different examples were failed on seven times. 2 different examples were failed on six times. etc. (See Table No. IV Chart 10). Most of the errors were due to a zero difficulty.

25 pupils had no error. 1 pupil failed on 17 examples, 1 pupil failed on 16 examples, 1 pupil failed on 10 examples, etc. (See Table No. IV. Chart 10)

The Class Median was 100.

The Class Mean was 97.6

The Most Common Errors were:

3	1	4	1	0	2	5	0	7
<u>x0</u>	<u>x1</u>	<u>x0</u>	<u>x0</u>	<u>x5</u>	<u>x0</u>	<u>x0</u>	<u>x3</u>	<u>x0</u>

Score range 83-100%

At the completion of the investigation, the class was 17.

It might be noted that the number of students who had been in the class

before the investigation was 17.

During the investigation, the number of students who had been in the class

before the investigation was 17.

It might be noted that the number of students who had been in the class

before the investigation was 17.

The class was 17.

The class was 17.

The class was 17.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----

The class was 17.

In June 1961, the class was 17.

Grand Total: 17.

A total of 17 students were in the class.

There are 17 students in the class.

There are 17 students in the class.

There are 17 students in the class.

There are 17 students in the class.

The class was 17.

The class was 17.

The class was 17.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----

The class was 17.



M U L T I P L I C A T I O N

OCTOBER 5, 1928

W I L S O N   I N V E N T O R Y

AND

D I A G N O S T I C   T E S T

TEST 5A

(See Charts No. 9 - 10)

CONFIDENTIAL

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CONFIDENTIAL

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CONFIDENTIAL



## WILSON INVENTORY AND DIAGNOSTIC TEST 5A

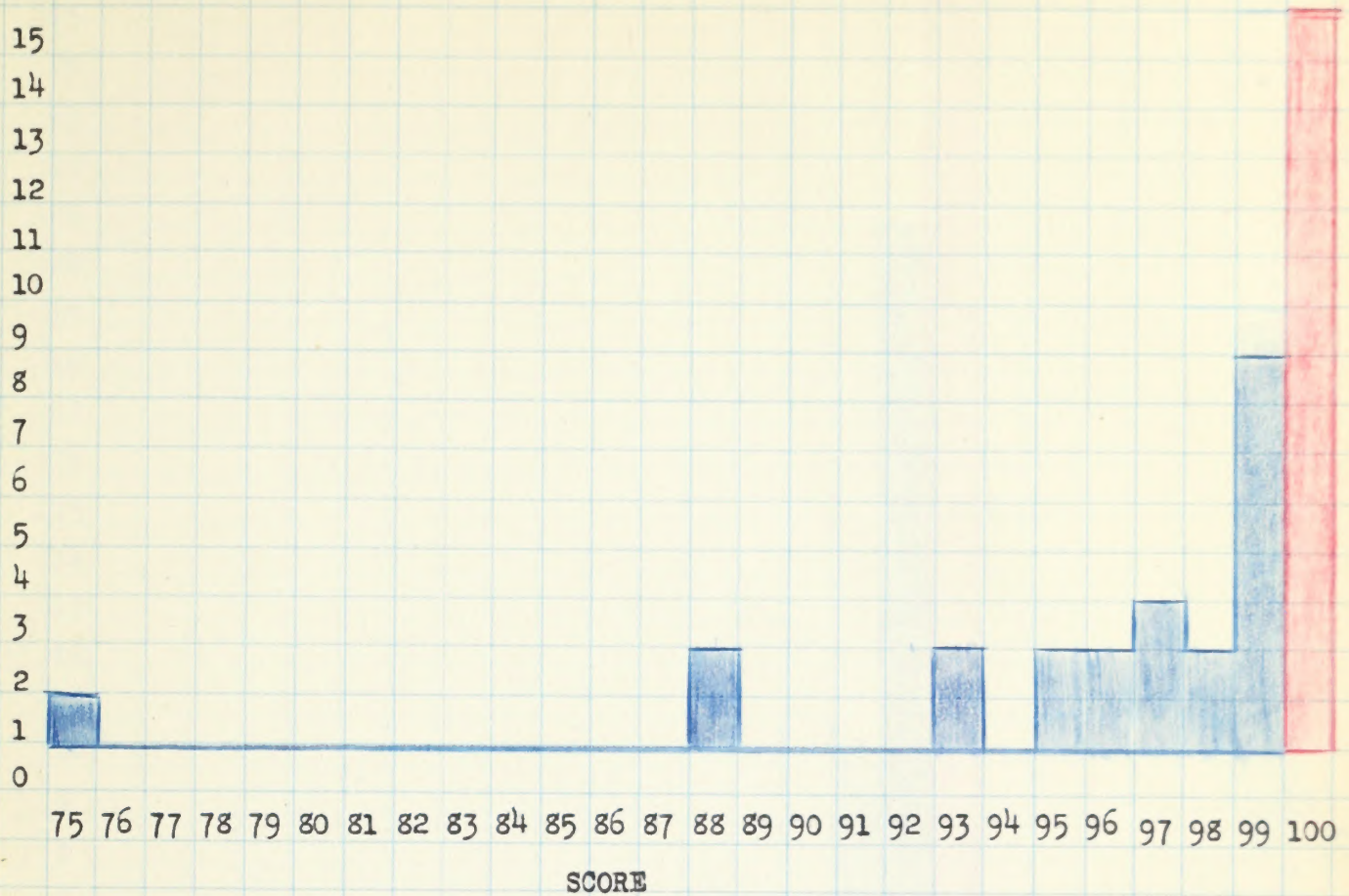


CHART NO. 9

GRAPH TO SHOW DISTRIBUTION OF SCORES IN TEST 5A GRADE VI 38 pupils

THIS CHART IS READ AS FOLLOWS:

1. 100% efficiency
2. scores less than 100%
3. 0-15 frequencies
4. 75-100 scores
5. median 99
6. Mean 94.7
7. Mode 100
8.  $Q^1$  - 97
9.  $Q^3$  @ 100







## WILSON INVENTORY AND DIAGNOSTIC TEST 5A

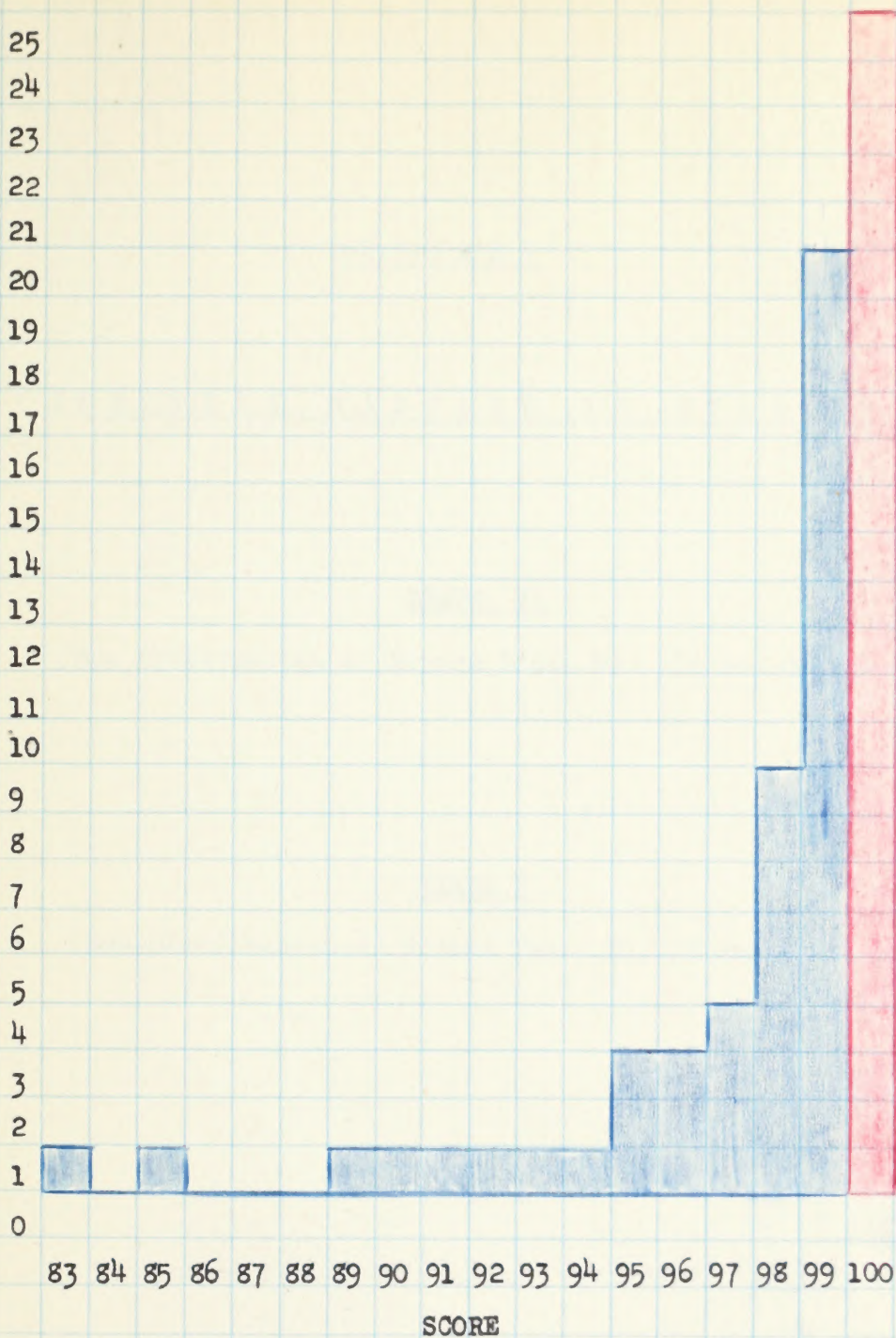


CHART NO. 10

Graph to Show Distribution of scores in Test 5A - GRADE V - 70 pupils

This Chart is read as follows:

1. 100% efficiency
2. Scores less than 100%
3. 0-25 frequencies
4. 83-100 scores
5. Median 100
6. Mean 97.6
7. Mode 100
8.  $q^1$  98
9.  $q^3$  100







S U M M A R Y

C H E C K I N G   M A S T E R Y   O F   M U L T I P L I C A T I O N

GRADE VI

(See Distribution of Errors Table No. III and Charts No. 9)

GRADE V

(See Distribution of Errors Table No. IV and Chart No. 10)

2

1911

CHIEF OF BUREAU OF THE ARMY

1911

(The Department of the Army, Washington, D.C.)

1911

(The Department of the Army, Washington, D.C.)



SUMMARY CHECKING MASTERY OF MULTIPLICATIONGRADE VITest 5A

Mean of errors 2.27

Median of errors 2.

38 pupils

100 examples

Most Common Errors

7	5	2	0	0	1	9	0	0
<u>x0</u>	<u>x0</u>	<u>x0</u>	<u>x6</u>	<u>x5</u>	<u>x0</u>	<u>x0</u>	<u>x3</u>	<u>x7</u>

Errors per pupil

8 pupils failed on 1 example

2 " " 2 examples

4 " " 3 "

1 " " 4 "

2 " " 5,6,7"

1 " " 10,12 "

15 pupils no errors

Different Examples Failed on

19 different examples failed on once

15 " " " twice

4 " " " three times

2 " " " four times

2 " " " five times

1 " " " seven times

no errors - 57

1925

1925

1925

1925

1925

1925

1925

1925

1925

1925

1925

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1925

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1925



EXAMPLES HAVING TWO OR MORE ERRORS IN MULTIPLICATION TEST

(See Table No. IV)

GRADE VI

Test 5 A

0	0	0	0	3	4	8	5	4	5	1	7	1	2	8	9
<u>x1</u>	<u>x2</u>	<u>x3</u>	<u>x4</u>	<u>x0</u>	<u>x0</u>	<u>x0</u>	<u>x4</u>	<u>x5</u>	<u>x9</u>	<u>x1</u>	<u>x7</u>	<u>x9</u>	<u>x1</u>	<u>x6</u>	<u>x9</u>

failed on twice.

0	0	9	1
<u>x8</u>	<u>x7</u>	<u>x0</u>	<u>x0</u>

failed on 3 times

0	0
<u>x6</u>	<u>x5</u>

failed on 4 times

2	7	5
<u>x0</u>	<u>x0</u>	<u>x0</u>

failed on 5 times





SUMMARY CHECKING MASTERY OF MULTIPLICATIONGRADE VTest 5A

Median of errors	2
Mean of errors	2.3
70 pupils	$\frac{166}{7000}$

100 examples

166 errors

Most Common Errors

3	1	4	1	0	2	5	0	7
<u>x0</u>	<u>x1</u>	<u>x0</u>	<u>x0</u>	<u>x5</u>	<u>x0</u>	<u>x0</u>	<u>x3</u>	<u>x0</u>

Different Examples Failed on

25 different examples failed on once

19	"	"	"	twice
5	"	"	"	three times
6	"	"	"	four times
2	"	"	"	five times
2	"	"	"	six times
5	"	"	"	seven times
1	"	"	"	eight times

35 no errors - 35%  
 Errors - 65%

Errors per pupil

17 pupils failed in 1 example

12	"	"	2	"
2	"	"	3	"
2	"	"	4	"
2	"	"	5	"
1	"	"	6	"
2	"	"	7	"
1	"	"	8	"

STATE OF NEW YORK

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1900

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## GRADE V - Test 5A - Continued

(See Table No. 171)

1 pupil failed on 9 examples

2 pupils failed on 10 examples

1 pupil " " 11 "

1 pupil " " 16 "

1 pupil " " 17 "

25 no errors

1. 10 - 10 - 10

2. 10 - 10 - 10

3. 10 - 10 - 10

4. 10 - 10 - 10

5. 10 - 10 - 10

6. 10 - 10 - 10



EXAMPLES HAVING TWO OR MORE ERRORS IN MULTIPLICATION TEST

(See Table No. III)

GRADE V

Test 5 A

1 0 0 8 6  
x9 x1 x7 x0 x1 failed on 3 times

0 0 0 6 0 3  
x2 x6 x8 x0 x9 x6 failed on 4 times

0 7  
x3 x0 failed on 5 times

1 4  
x0 x0 failed on 6 times

5 2 0 9 1  
x0 x0 x5 x0 x1 failed on 7 times

3  
x0 failed on 8 times

(See Table No. 111)

TABLE

TABLE

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TABLE

TABLE  
TABLE

TABLE  
TABLE









(See Distribution Sheet Table No. III and Charts No. 11-12-13)

The short division tests were done after the Multiplication tests had been completed. Test 6 A had 100 examples, which was made up of the 81 quotients up to 9's in 81 and some repetitions.

There were 64 errors in Grade VI, 38 pupils.

The Class Median was 99.

The Class Mean was 98%

One pupil failed on 10 examples, 1 failed on 9, etc. (See Distribution Sheet Table No. III Chart No. 11) 5 different examples were failed on 3 times.

Most common Errors were:

$$1\overline{)7}, 8\overline{)48} \quad 1\overline{)3} \quad 9\overline{)54}$$

Score range 84-100%

Test 6 B Part 1 and 2.

In these tests there were 400 examples or 200 examples in each test. These tests contained the 368 uneven short division up to 9's in 89.

In Grade VI, 38 pupils, on Test 6 B<sup>1</sup> no pupil had 100% efficiency.

(See Chart No. 12)

The Median was 91.

The Class Mean was 91%

Most of the errors in this test occurred in such examples that had a dividend smaller than the divisor.

There were 556 errors. One example was failed on 27 times, 5 examples were failed on 24 times, 1 example was failed on 22 times, 2 examples failed on 20 times, etc. (See Distribution Sheet Table No. III)

91 Different Examples had no errors.

1 pupil failed on 28 examples, 1 failed on 27 examples, 1 failed on 26 examples, 2 failed on 25 examples, etc. (See Table No. III)

1944-1945

The first of these is the fact that the number of people who are employed in the service of the State has increased steadily since 1940. This is due to the fact that the State has been able to attract more people to its service than it has been able to lose.

There are two main reasons for this. First, the State has been able to attract more people to its service than it has been able to lose.

Second, the State has been able to attract more people to its service than it has been able to lose.

Third, the State has been able to attract more people to its service than it has been able to lose.

One of the main reasons for this is the fact that the State has been able to attract more people to its service than it has been able to lose.

Another reason is the fact that the State has been able to attract more people to its service than it has been able to lose.

There are two main reasons for this. First, the State has been able to attract more people to its service than it has been able to lose.

Second, the State has been able to attract more people to its service than it has been able to lose.

Third, the State has been able to attract more people to its service than it has been able to lose.

Fourth, the State has been able to attract more people to its service than it has been able to lose.

Fifth, the State has been able to attract more people to its service than it has been able to lose.

Sixth, the State has been able to attract more people to its service than it has been able to lose.

Seventh, the State has been able to attract more people to its service than it has been able to lose.

Eighth, the State has been able to attract more people to its service than it has been able to lose.

Ninth, the State has been able to attract more people to its service than it has been able to lose.

Tenth, the State has been able to attract more people to its service than it has been able to lose.

Eleventh, the State has been able to attract more people to its service than it has been able to lose.

Twelfth, the State has been able to attract more people to its service than it has been able to lose.

Thirteenth, the State has been able to attract more people to its service than it has been able to lose.

Fourteenth, the State has been able to attract more people to its service than it has been able to lose.

Fifteenth, the State has been able to attract more people to its service than it has been able to lose.

Sixteenth, the State has been able to attract more people to its service than it has been able to lose.

Seventeenth, the State has been able to attract more people to its service than it has been able to lose.

Eighteenth, the State has been able to attract more people to its service than it has been able to lose.

Nineteenth, the State has been able to attract more people to its service than it has been able to lose.



The most Common Errors were:

$7\overline{)6}$   $6\overline{)4}$   $7\overline{)3}$   $6\overline{)3}$   $5\overline{)2}$   $7\overline{)5}$   $9\overline{)7}$   $8\overline{)4}$   $7\overline{)1}$   $8\overline{)2}$   $8\overline{)3}$   $9\overline{)2}$   $9\overline{)8}$   
 $4\overline{)2}$   $6\overline{)5}$   $7\overline{)6}$   $8\overline{)6}$   $3\overline{)1}$   $7\overline{)4}$   $4\overline{)1}$   $7\overline{)0}$   $8\overline{)0}$   $9\overline{)79}$

No pupil was 100% efficient in Test 6 B<sup>1</sup>.

Score range 75 - 99%.

On Test 6 B<sup>2</sup> no pupil in Grade VI was 100% efficient. One pupil failed on 30 examples, 1 failed on 27 examples, 1 failed on 23 examples, etc. (See Table No. III Chart No. 13)

There were 200 examples in this test, 92 examples had no errors. 1 example 5)0, was failed on twelve times, 3 examples were failed on nine times, etc. (See Table No. III)

There were 296 errors in Test 6 B<sup>2</sup>. Most of them occurred in such examples that had a dividend smaller than the divisor and a zero difficulty.

The most Common Errors were:

$5\overline{)0}$   $2\overline{)0}$   $9\overline{)0}$   $6\overline{)0}$   $6\overline{)2}$   $9\overline{)3}$   $9\overline{)89}$   $6\overline{)1}$   $7\overline{)2}$   $9\overline{)4}$   $4\overline{)3}$   
 $5\overline{)1}$   $3\overline{)2}$   $9\overline{)6}$

The Class Median was 97.

The Class Mean was 95.7

Score Range 83-99%

Grade 5.

(See Distribution Sheet Table No. IV and Charts No. 14, 15, 16)

Test 6A On this test Grade V, 70 pupils had 179 errors, most of these occurred where the divisor was 1.

2 pupils failed on twelve examples.

4 pupils failed on ten examples.

2 pupils failed on eight examples, etc. (See Table No. II)

24 pupils had no errors.

27 examples had no errors.

ASTOR LENOX TILDEN FOUNDATION  
455 FIFTH AVENUE  
NEW YORK 17, N. Y.

It will be noted that the

first name is

of the first name is

and the second name is

(The first name is)

There are two names in this case, and the first name is

and the second name is

(The first name is)

There are two names in this case, and the first name is

and the second name is

The first name is

The first name is

The first name is

The first name is

The first name is

The first name is

The first name is

(The first name is)

The first name is

The first name is

The first name is

The first name is

The first name is

The first name is

The first name is

THE NEW YORK PUBLIC LIBRARY  
ASTOR LENOX TILDEN FOUNDATION  
455 FIFTH AVENUE  
NEW YORK 17, N. Y.



1 example was failed on 10 times.

1 example was failed on 8 times.

4 examples were failed on 7 times, etc.

The Class Median was 98.

The Class Mean was 97.6

Score range 84-100.

The Most Common Errors were:

$1\overline{1}$   $1\overline{2}$   $1\overline{3}$   $1\overline{4}$   $1\overline{6}$   $1\overline{5}$   $1\overline{9}$   $1\overline{7}$

Test 6 B<sup>1</sup>, pupils of Grade V, 70 pupils, had 1061 errors. Many of these errors occurred where the dividend was smaller than the divisor. Only one person was 100% efficient in that test.

One pupil failed on 62 examples, one failed on 60 examples, 1 failed on 45 examples, 2 failed on 39 examples, etc. (See Distribution Sheet Table No. IV and Charts No. 14-16)

8 Examples had no errors.

1 example was failed on 24 times.

2 examples were failed on 23 times.

1 example was failed on 22 times.

2 examples were failed on 20 times, etc. (See Table No. )

The Class Median was 95.

The Class Mean was 92.5%

Score range 75-100%

The Most Common Errors:

$7\overline{5}$   $7\overline{1}$   $6\overline{53}$   $7\overline{39}$   $7\overline{6}$   $5\overline{2}$   $8\overline{3}$   $7\overline{6}$   $7\overline{0}$   $9\overline{2}$   $8\overline{6}$   $8\overline{0}$   $9\overline{1}$   
 $7\overline{3}$   $9\overline{7}$   $9\overline{8}$   $3\overline{1}$   $9\overline{79}$   $6\overline{3}$   $8\overline{4}$   $4\overline{2}$   $7\overline{4}$   $7\overline{1}$   $8\overline{2}$   $6\overline{5}$   $4\overline{1}$

On Test 6 B<sup>2</sup> 1 pupil in Grade V, 70 pupils, had no error. There were 663 errors. One pupil failed on 69 examples, 1 pupil failed on 42 examples, 1 pupil failed on 29 examples. etc (See Distribution Sheet Table No. IV Chart No. 14-16)





26 examples had no errors.

One example was failed on sixteen times, 1 example was failed on fifteen times, 2 examples were failed on twelve times, 2 examples were failed on eleven times, etc.

The Class Median was 96.5

The Class Mean was 94.4

The Most Common Errors were:

$2\overline{0}$     $6\overline{28}$     $8\overline{7}$     $4\overline{0}$     $6\overline{1}$     $9\overline{1}$     $8\overline{5}$     $6\overline{46}$     $8\overline{1}$     $3\overline{0}$     $9\overline{0}$   
 $2\overline{1}$     $7\overline{2}$

Score range 83-100.





S U M M A R Y

C H E C K I N G   M A S T E R Y   O F   S H O R T   D I V I S I O N

G R A D E   V I

(See Distribution of Errors Table No. III and Charts No.11,12,13)

G R A D E   V

(See Distribution of Errors Table No. IV and Charts No.14,15,16)





SUMMARYCHECKING MASTERY OF SHORT DIVISIONGRADE VITest 6 A

Median of Errors 2

Mean of Errors 1.7

I            38 pupils  
                         64  
 100 examples 3800  
                         64 errors.

II        Most Common Errors

$$1\overline{)7} \quad 8\overline{)48} \quad 1\overline{)3} \quad 9\overline{)54}$$
III       Errors in Different Examples

60 examples no errors

21 different examples failed on once

14       "       "       "       twice

5       "       "       "       three times

IV       Errors per pupil

13 pupils no errors.

11 pupils failed on 1 example

8       "       "       "       2       "

2       "       "       "       3       "

1       "       "       "       5       "

1       "       "       "       7       "

1       "       "       "       9       "

1       "       "       "       10       "

Test 6 B <sup>1</sup>I       Median of Errors    2

Mean of Errors 7.3

38 pupils 556  
                         7600  
 200 examples  
 556 errors.





II. Most Common Errors;

$7\overline{)6}$     $6\overline{)4}$     $7\overline{)3}$     $6\overline{)3}$     $5\overline{)2}$     $7\overline{)5}$     $9\overline{)7}$     $8\overline{)4}$     $7\overline{)1}$     $8\overline{)2}$     $8\overline{)3}$   
 $9\overline{)2}$     $9\overline{)8}$     $4\overline{)2}$     $6\overline{)5}$     $7\overline{)6}$     $8\overline{)6}$     $3\overline{)1}$     $7\overline{)4}$     $4\overline{)1}$     $7\overline{)0}$     $8\overline{)0}$     $9\overline{)79}$

III. Errors per pupil

1 pupil failed on 1,3,12,16,26,27,28 examples

2 " " " 6,10,13,14,20,21,22,24,25

4 " " " 8,19

5 " " " 5

IV. Errors in Different Examples

91 examples no errors.

55 different examples failed on once

13	"	"	"	"	twice
13	"	"	"	"	three times
2	"	"	"	"	four times
2	"	"	"	"	five times
4	"	"	"	"	six times
1		"	"	"	thirteen times
1		"	"	"	sixteen times
3	"	"	"	"	nineteen times
4	"	"	"	"	nineteen times
2	"	"	"	"	twenty times
2	"	"	"	"	twenty-one times
1	"	"	"	"	twenty-two times
5	"	"	"	"	twenty-four times
1	"	"	"	"	twenty-seven times





SUMMARY CHECKING MASTERY OF SHORT DIVISIONGRADE VITEST 6 B<sup>2</sup>

I. Median of Errors 4  
Mean of Errors 3.9

38 pupils

200 examples  $\frac{296}{7600}$

296 errors.

II. Most Common Errors

5)0 2)0 9)0 6)0 6)2 9)3 9)89 6)1 7)2 9)4 4)3  
5)1 3)2 9)6

III. Errors in Different Examples

92 examples - no errors.

46 different examples failed on once

24	"	"	"	"	twice
11	"	"	"	"	three times
8	"	"	"	"	four times
2	"	"	"	"	five times
3	"	"	"	"	six times
8	"	"	"	"	seven times
2	"	"	"	"	eight times
3	"	"	"	"	nine times
1	"	"	"	"	twelve times.

IV. Errors per pupil

5 pupils failed on one example

6 " " " 2 examples

7 " " " 3 "

1 " " " 4 "

4 " " " 5 "

2 " " " 6 "





1 pupil failed on 7 examples

1 " " " 9 "

2 pupils " " 13,14,18 examples

1 pupil " " 17,19,23,27,30 examples

## GRADE V

### Test 6 A

I. Median of Errors 2

Mean of Errors 2.5

70 pupils

100 examples

179 errors

II. Most Common Errors

1)1 1)2 1)3 1)4 1)6 1)5 1)9 1)7

III. Errors in Different Examples

27 examples - no errors.

30 different examples failed on once.

21	"	"	"	"	twice
3	"	"	"	"	three times
5	"	"	"	"	four times
4	"	"	"	"	five times
2	"	"	"	"	six times
4	"	"	"	"	seven times
1	"	"	"	"	eight times
1	"	"	"	"	ten times

IV. Errors per pupil

24 pupils no errors.

8 pupils failed on 1 example

9 " " " 2 examples

14 " " " 3 "





5 pupils failed on 4 examples

1 pupil " " 5 "

1 " " " 6 "

2 " " " 8 "

## GRADE V

Test 6 B<sup>1</sup>

I Median of Errors 4

Mean of Errors 7.5

70 pupils  $\frac{1061}{14000}$

200 Examples

1061 errors

## II Most Common Errors

$\overline{7)5}$   $\overline{7)1}$   $\overline{6)53}$   $\overline{7)39}$   $\overline{7)6}$   $\overline{5)2}$   $\overline{8)3}$   $\overline{7)0}$   $\overline{9)2}$   $\overline{8)6}$   $\overline{8)0}$   $\overline{9)1}$   
 $\overline{7)3}$   $\overline{9)7}$   $\overline{9)8}$   $\overline{3)1}$   $\overline{9)79}$   $\overline{6)3}$   $\overline{8)4}$   $\overline{4)2}$   $\overline{7)4}$   $\overline{8)2}$   $\overline{6)5}$   $\overline{4)1}$

## III Errors in Different Examples

8 examples no Errors.

19 different examples failed on once

31	"	"	"	"	twice
30	"	"	"	"	three times
26	"	"	"	"	four times
24	"	"	"	"	five times
21	"	"	"	"	six times
9	"	"	"	"	seven times
7	"	"	"	"	eight times
1	"	"	"	"	nine times
1	"	"	"	"	ten times
1	"	"	"	"	eleven times
1	"	"	"	"	twelve times
1	"	"	"	"	fourteen times





3	different examples	failed on	fifteen times
2	"	"	sixteen times
1	"	"	seventeen times
3	"	"	eighteen times
1	"	"	nineteen times
2	"	"	twenty times
2	"	"	twenty-one times
1	"	"	twenty-two times
2	"	"	twenty-three times
1	"	"	twenty-four times

#### IV. Errors per pupil

1 pupil no error.

1 pupil failed on 2 examples

4 pupils	"	"	3	"
6	"	"	4	"
4	"	"	5	"
6	"	"	6	"
2	"	"	7	"
4	"	"	8	"
6	"	"	9	"
3	"	"	10	"
3	"	"	11	"
1	"	"	12	"
1	"	"	13	"
3	"	"	14	"
2	"	"	15	"
1	"	"	17	"
1	"	"	18	"
1	"	"	20	"





1 pupil failed on 21 examples

1 " " " 22 "

3 PUPILS " " 23 "

2 " " " 25 "

1 pupil " " 27 "

2 pupils " " 28 "

1 pupil " " 30 "

2 pupils " " 31 "

1 pupil " " 34 "

1 " " " 36 "

2 pupils " " 39 "

1 pupil " " 45 "

1 " " " 60 "

1 " " " 62 "

# GRADE V

## TEST 6 B<sup>2</sup>

Median of Errors 2

Mean of Errors 4.7

70 pupils  $\frac{663}{14000}$

200 examples

663 errors

## Most Common Errors

2)0 6)28 8)7 4)0 6)1 9)1 8)5 5)46 8)1 3)0 9)0  
2)1 7)2

## Errors in Different Examples

26 Examples no errors.

46 Examples failed on once

32 " " twice





31 examples failed on three times

15	"	"	four	"
13	"	"	five	"
3	"	"	six	"
7	"	"	seven	"
5	"	"	eight	"
8	"	"	nine	"
8	"	"	ten	"
2	"	"	eleven	"
2	"	"	twelve	"
1	"	"	fifteen times	
1	"	"	sixteen	"

#### Errors per pupil

1 pupil no Errors

7 pupils failed on 1 example

3	"	"	" 2,3,7,8,17 examples
8	"	"	4 examples
9	"	"	5 "
7	"	"	6 "
4	"	"	9 "
4	"	"	10 "
2	"	"	12,20,21 examples
1	"	"	14,15,16,18,19,22,29,42,69 examples

TABLE NO. 10 - 1940

1	1940	1	1	1
2	1941	2	2	2
3	1942	3	3	3
4	1943	4	4	4
5	1944	5	5	5
6	1945	6	6	6
7	1946	7	7	7
8	1947	8	8	8
9	1948	9	9	9
10	1949	10	10	10
11	1950	11	11	11
12	1951	12	12	12
13	1952	13	13	13
14	1953	14	14	14
15	1954	15	15	15
16	1955	16	16	16
17	1956	17	17	17
18	1957	18	18	18
19	1958	19	19	19
20	1959	20	20	20
21	1960	21	21	21
22	1961	22	22	22
23	1962	23	23	23
24	1963	24	24	24
25	1964	25	25	25
26	1965	26	26	26
27	1966	27	27	27
28	1967	28	28	28
29	1968	29	29	29
30	1969	30	30	30
31	1970	31	31	31
32	1971	32	32	32
33	1972	33	33	33
34	1973	34	34	34
35	1974	35	35	35
36	1975	36	36	36
37	1976	37	37	37
38	1977	38	38	38
39	1978	39	39	39
40	1979	40	40	40
41	1980	41	41	41
42	1981	42	42	42
43	1982	43	43	43
44	1983	44	44	44
45	1984	45	45	45
46	1985	46	46	46
47	1986	47	47	47
48	1987	48	48	48
49	1988	49	49	49
50	1989	50	50	50
51	1990	51	51	51
52	1991	52	52	52
53	1992	53	53	53
54	1993	54	54	54
55	1994	55	55	55
56	1995	56	56	56
57	1996	57	57	57
58	1997	58	58	58
59	1998	59	59	59
60	1999	60	60	60
61	2000	61	61	61
62	2001	62	62	62
63	2002	63	63	63
64	2003	64	64	64
65	2004	65	65	65
66	2005	66	66	66
67	2006	67	67	67
68	2007	68	68	68
69	2008	69	69	69
70	2009	70	70	70
71	2010	71	71	71
72	2011	72	72	72
73	2012	73	73	73
74	2013	74	74	74
75	2014	75	75	75
76	2015	76	76	76
77	2016	77	77	77
78	2017	78	78	78
79	2018	79	79	79
80	2019	80	80	80
81	2020	81	81	81
82	2021	82	82	82
83	2022	83	83	83
84	2023	84	84	84
85	2024	85	85	85
86	2025	86	86	86
87	2026	87	87	87
88	2027	88	88	88
89	2028	89	89	89
90	2029	90	90	90
91	2030	91	91	91
92	2031	92	92	92
93	2032	93	93	93
94	2033	94	94	94
95	2034	95	95	95
96	2035	96	96	96
97	2036	97	97	97
98	2037	98	98	98
99	2038	99	99	99
100	2039	100	100	100

TABLE NO. 11 - 1940

TABLE NO. 12 - 1940

TABLE NO. 13 - 1940

TABLE NO. 14 - 1940

TABLE NO. 15 - 1940

TABLE NO. 16 - 1940

TABLE NO. 17 - 1940

TABLE NO. 18 - 1940

TABLE NO. 19 - 1940

TABLE NO. 20 - 1940

TABLE NO. 21 - 1940



EXAMPLES HAVING TWO OR MORE ERRORS IN SHORT DIVISION BY TESTS

(See Table No. IV)

GRADE VITest 6A
 $1\overline{)9}$   $1\overline{)5}$   $1\overline{)8}$   $1\overline{)6}$   $1\overline{)1}$   $2\overline{)18}$   $3\overline{)15}$   $3\overline{)27}$   $5\overline{)40}$   $6\overline{)18}$   $8\overline{)8}$   $8\overline{)72}$ 
 $9\overline{)9}$  failed on twice

 $1\overline{)7}$   $1\overline{)3}$   $1\overline{)2}$   $6\overline{)42}$  failed on 3 times

 $9\overline{)54}$  failed on 5 times
Test 6B<sup>1</sup>
 $6\overline{)46}$   $8\overline{)57}$   $8\overline{)37}$   $6\overline{)39}$   $7\overline{)65}$   $7\overline{)17}$   $9\overline{)53}$   $8\overline{)22}$   $8\overline{)67}$   $5\overline{)37}$ 
 $7\overline{)66}$   $5\overline{)36}$  failed on 3 times

 $6\overline{)51}$   $7\overline{)67}$  failed on 4 times

 $9\overline{)42}$   $9\overline{)46}$  failed on 5 times

 $7\overline{)67}$   $8\overline{)0}$   $9\overline{)71}$   $9\overline{)79}$  failed on 6 times

 $7\overline{)0}$  failed on 7 times

 $4\overline{)1}$  failed on 13 times

 $7\overline{)4}$  failed on 16 times

 $7\overline{)6}$   $8\overline{)6}$   $3\overline{)1}$  failed on 18 times

 $9\overline{)6}$   $6\overline{)5}$   $4\overline{)2}$   $9\overline{)2}$  failed on 19 times

 $7\overline{)1}$   $8\overline{)3}$  failed on 20 times

 $8\overline{)4}$   $8\overline{)2}$  failed on 21 times

 $9\overline{)7}$  failed on 22 times

 $6\overline{)4}$   $7\overline{)3}$   $7\overline{)5}$   $5\overline{)2}$   $6\overline{)3}$  failed on 24 times
Test 6B<sup>2</sup>
 $8\overline{)27}$   $9\overline{)60}$   $5\overline{)7}$   $9\overline{)83}$   $4\overline{)37}$   $9\overline{)43}$   $6\overline{)17}$   $9\overline{)39}$   $3\overline{)19}$  failed on 3 times

 $9\overline{)43}$   $3\overline{)22}$   $9\overline{)5}$   $9\overline{)40}$   $9\overline{)24}$   $8\overline{)1}$   $5\overline{)46}$  failed on 4 times

 $3\overline{)4}$   $8\overline{)5}$  failed on 5 times

REPORT OF THE COMMISSIONER OF THE GENERAL LAND OFFICE

(For the year 1900)

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Test 6 B<sup>2</sup> (continued)

$6\overline{)2}$   $9\overline{)1}$   $3\overline{)0}$  failed on 6 times

$9\overline{)89}$   $6\overline{)1}$   $7\overline{)2}$   $9\overline{)4}$   $4\overline{)3}$   $5\overline{)1}$   $2\overline{)2}$   $9\overline{)6}$  failed on 7 times

$4\overline{)0}$   $9\overline{)3}$  failed on 8 times

$9\overline{)0}$   $2\overline{)0}$   $6\overline{)0}$  failed on 9 times

$5\overline{)0}$  failed on 12 times

(Continued) See p. 42

about 3 no. 10000 100 100 100

about 5 no. 10000 100 100 100 100 100 100

about 3 no. 10000 100 100

about 2 no. 10000 100 100 100

about 1 no. 10000 100



EXAMPLES HAVING THREE OR MORE ERRORS IN SHORT DIVISION TEST

(See Table No. III)

GRADE VTest 6 A $6\overline{)42}$   $5\overline{)5}$   $8\overline{)24}$  failed on 3 times $4\overline{)28}$   $9\overline{)9}$   $6\overline{)6}$   $9\overline{)54}$   $8\overline{)48}$  failed on 4 times $9\overline{)54}$   $3\overline{)27}$   $1\overline{)8}$   $6\overline{)24}$  failed on 5 times $1\overline{)7}$   $1\overline{)1}$  failed on 6 times $1\overline{)19}$   $1\overline{)5}$   $1\overline{)6}$   $1\overline{)4}$  failed on 7 times $1\overline{)3}$  failed on 8 times $1\overline{)2}$  failed on 10 timesTest 6 B<sup>1</sup> $6\overline{)46}$   $8\overline{)71}$   $7\overline{)29}$   $9\overline{)80}$   $8\overline{)18}$   $7\overline{)12}$   $8\overline{)61}$   $8\overline{)59}$   $6\overline{)59}$   $6\overline{)34}$   $8\overline{)31}$   $6\overline{)21}$  $9\overline{)29}$   $8\overline{)74}$   $5\overline{)26}$   $8\overline{)12}$   $9\overline{)38}$   $4\overline{)17}$   $5\overline{)27}$   $3\overline{)26}$   $8\overline{)41}$   $9\overline{)15}$   $9\overline{)83}$   $9\overline{)23}$  $9\overline{)30}$   $9\overline{)75}$   $4\overline{)21}$   $4\overline{)6}$   $9\overline{)88}$  failed on 3 times. $9\overline{)33}$   $9\overline{)51}$   $8\overline{)11}$   $5\overline{)49}$   $9\overline{)85}$   $9\overline{)42}$   $5\overline{)19}$   $8\overline{)14}$   $4\overline{)13}$   $9\overline{)48}$   $8\overline{)76}$   $5\overline{)37}$  $6\overline{)7}$   $6\overline{)58}$   $8\overline{)75}$   $7\overline{)20}$   $6\overline{)27}$   $9\overline{)47}$   $8\overline{)43}$   $2\overline{)5}$   $7\overline{)66}$   $8\overline{)53}$   $6\overline{)40}$   $9\overline{)65}$  $2\overline{)15}$   $8\overline{)68}$  failed on 4 times. $8\overline{)25}$   $7\overline{)68}$   $2\overline{)3}$   $8\overline{)36}$   $5\overline{)38}$   $9\overline{)46}$   $6\overline{)32}$   $6\overline{)31}$   $8\overline{)54}$   $9\overline{)88}$   $8\overline{)67}$   $7\overline{)54}$  $9\overline{)41}$   $7\overline{)68}$   $4\overline{)25}$   $4\overline{)26}$   $7\overline{)34}$   $8\overline{)77}$   $8\overline{)62}$   $4\overline{)22}$   $8\overline{)51}$   $6\overline{)58}$   $7\overline{)62}$  $7\overline{)22}$  failed on 5 times $6\overline{)52}$   $6\overline{)51}$   $6\overline{)45}$   $9\overline{)35}$   $8\overline{)39}$   $6\overline{)67}$   $7\overline{)67}$   $4\overline{)11}$   $8\overline{)70}$   $6\overline{)47}$   $7\overline{)32}$   $8\overline{)22}$  $7\overline{)41}$   $7\overline{)24}$   $7\overline{)51}$   $9\overline{)49}$   $7\overline{)46}$   $6\overline{)26}$   $5\overline{)36}$   $7\overline{)64}$  failed on 6 times $7\overline{)61}$   $9\overline{)17}$   $7\overline{)53}$   $8\overline{)70}$   $9\overline{)50}$   $9\overline{)79}$   $9\overline{)78}$   $8\overline{)63}$  failed on 7 times $7\overline{)55}$   $7\overline{)65}$   $8\overline{)0}$   $9\overline{)71}$   $9\overline{)53}$   $9\overline{)52}$   $9\overline{)87}$  failed on 8 times $8\overline{)37}$  failed on 9 times $7\overline{)61}$  failed on 10 times

(See Table No. 111)

TABLE 1

Test 6 A

Test 6 A  
Test 6 A  
Test 6 A

Test 6 A  
Test 6 A  
Test 6 A

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Test 6 B



Test 6 B<sup>1</sup> continued

$4\overline{)2}$   $3\overline{)1}$  failed on 11 times

$2\overline{)17}$  failed on 12 times

$7\overline{)0}$  failed on 13 times

$5\overline{)2}$  failed on 14 times

$7\overline{)39}$   $7\overline{)5}$   $6\overline{)3}$  failed on 15 times

$8\overline{)2}$   $9\overline{)2}$   $6\overline{)4}$  failed on 16 times

$7\overline{)1}$  failed on 17 times

$7\overline{)4}$   $8\overline{)6}$   $9\overline{)7}$  failed on 18 times

$9\overline{)8}$   $4\overline{)1}$  failed on 20 times

$7\overline{)3}$   $8\overline{)3}$  failed on 21 times

$7\overline{)6}$  failed on 22 times

$8\overline{)4}$   $6\overline{)5}$  failed on 23 times

$6\overline{)53}$  failed on 24 times

Test 6B<sup>2</sup>

$9\overline{)43}$   $9\overline{)89}$   $5\overline{)3}$   $3\overline{)23}$   $7\overline{)62}$   $7\overline{)66}$   $3\overline{)28}$   $8\overline{)38}$   $4\overline{)37}$   $8\overline{)33}$   $4\overline{)38}$   $9\overline{)66}$   $7\overline{)61}$   
failed on 5 times

$9\overline{)87}$   $8\overline{)52}$   $3\overline{)17}$  failed on 6 times

$9\overline{)25}$   $9\overline{)80}$   $5\overline{)4}$   $9\overline{)5}$   $4\overline{)3}$   $9\overline{)24}$   $8\overline{)15}$  failed on 7 times

$8\overline{)27}$   $9\overline{)4}$   $5\overline{)1}$   $9\overline{)34}$   $8\overline{)71}$  failed on 8 times

$6\overline{)2}$   $9\overline{)3}$   $7\overline{)69}$   $6\overline{)49}$   $5\overline{)0}$   $6\overline{)0}$   $3\overline{)2}$   $9\overline{)6}$  failed on 9 times

$9\overline{)1}$   $7\overline{)2}$   $2\overline{)1}$   $9\overline{)0}$   $3\overline{)0}$   $8\overline{)1}$   $5\overline{)46}$  failed on 10 times

$8\overline{)5}$   $6\overline{)1}$  failed on 11 times

$8\overline{)7}$   $4\overline{)0}$  failed on 12 times

$6\overline{)28}$  failed on 15 times

$2\overline{)0}$  failed on 16 times

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SHORT DIVISION CHARTS OCT. 3, 1928

GRADE V - GRADE VI

WILSON INVENTORY AND

DIAGNOSTIC TEST

TEST 6A

TEST 6B Part 1

TEST 6B Part 2

(See Charts No. 11 - 16)





## WILSON INVENTORY AND DIAGNOSTIC TEST 6A

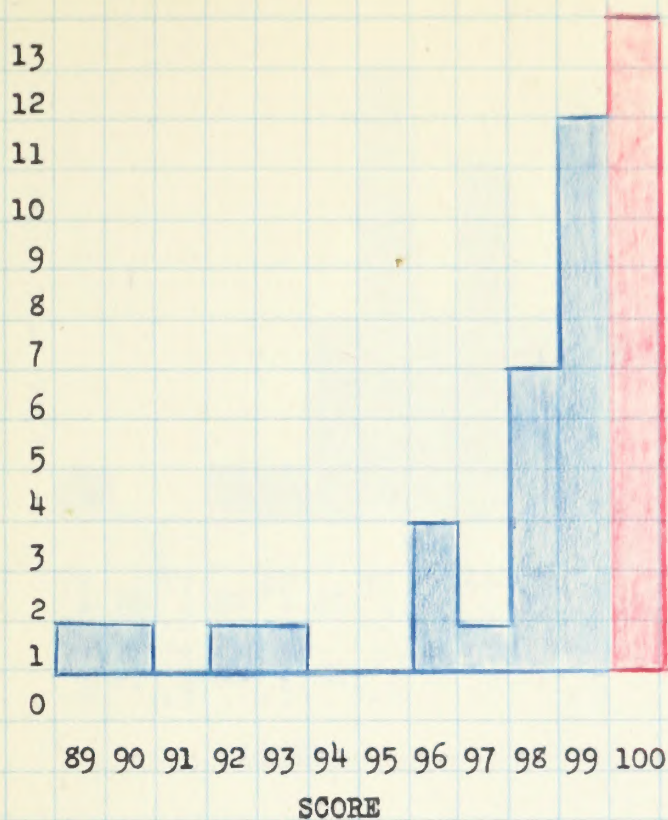


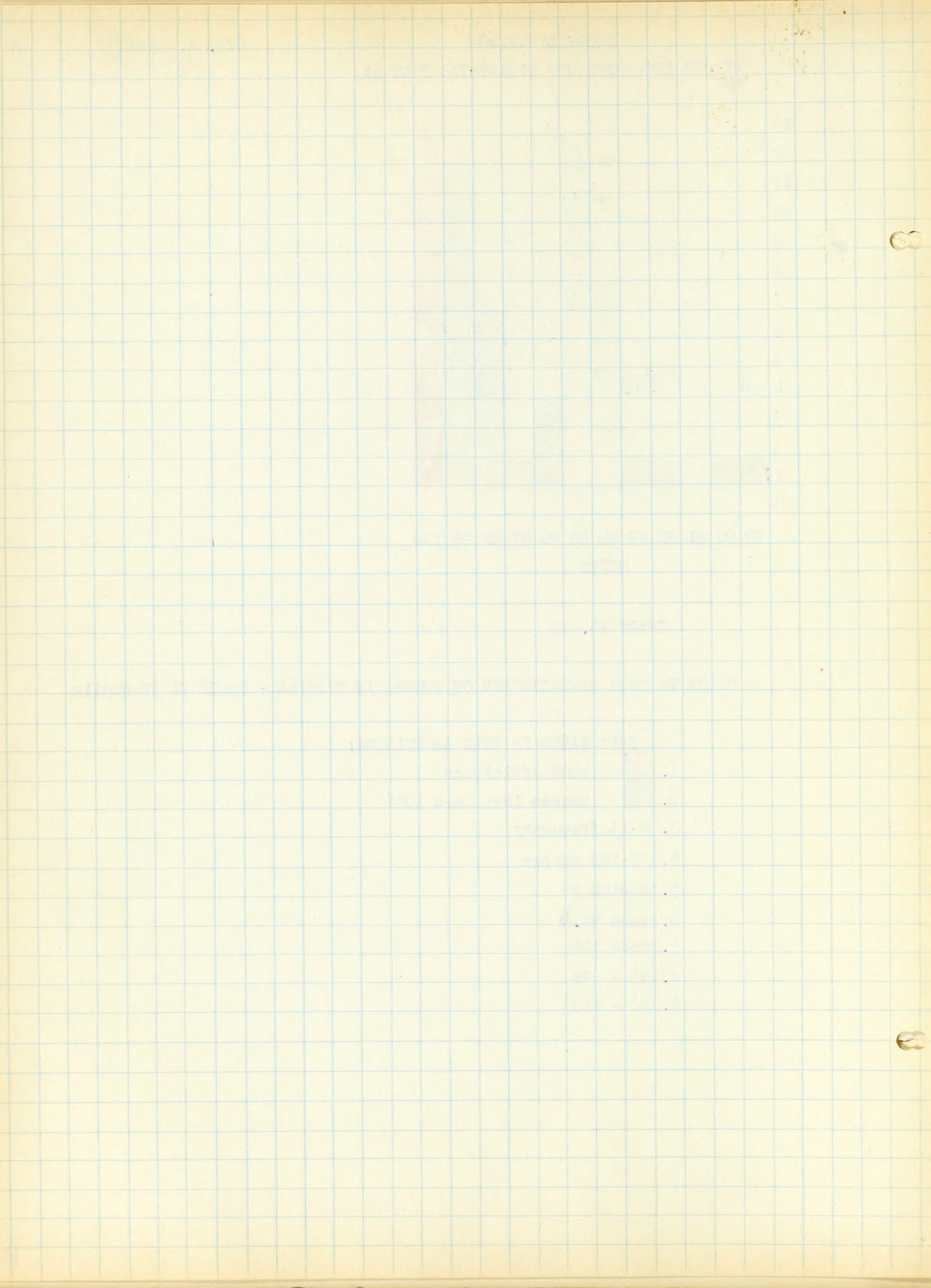
CHART NO. 11

GRAPH TO SHOW DISTRIBUTION OF SCORES IN TEST 6A - GRADE VI 38 pupils

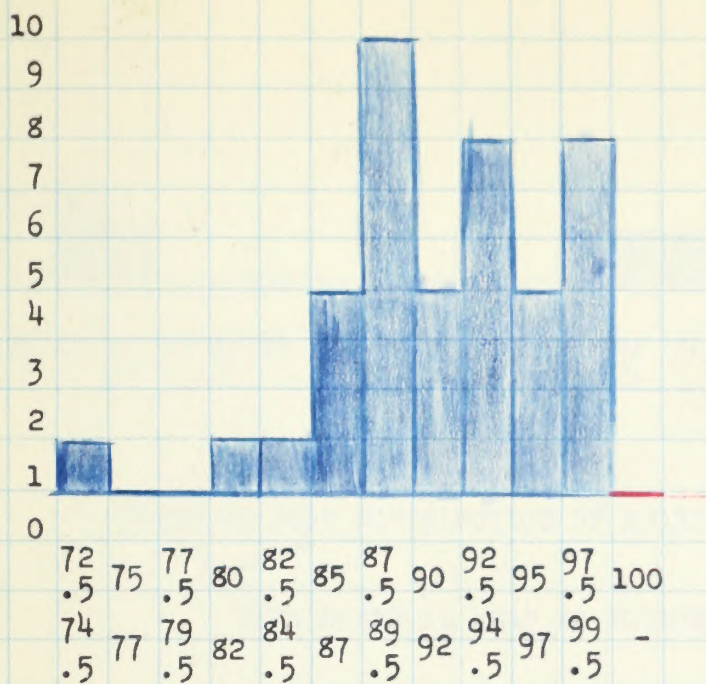
THIS TABLE IS READ AS FOLLOWS:

1.  100% efficiency
2.  scores less than 100%
3. 0-13 frequency
4. 89-100 scores
5. Median 99
6. Mean 98.
7. Mode 100
8.  $q^1$  - 98
9.  $q^3$  - 100









WILSON INVENTORY AND DIAGNOSTIC TEST 6B<sup>1</sup>

SCORES

CHART NO. 12

Graph to Show distribution of scores in Test 6B<sup>1</sup>. GRADE VI 38 pupils

THIS CHART IS READ AS FOLLOWS:

1.  100% efficiency
2.  Scores less than 100%
3. 0-10 frequency
4. 72.5-100 Scores
5. Median 91
6. Mean 91
7. Mode 88.5 (87.5-89.5)
8.  $Q^1$  - 88.5
9.  $Q^3$  - 96



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6. 100-100000  
7. 100-100000  
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9. 100-100000  
10. 100-100000



SHORT DIVISION  
WILSON INVENTORY AND DIAGNOSTIC TEST 6 B<sup>2</sup>

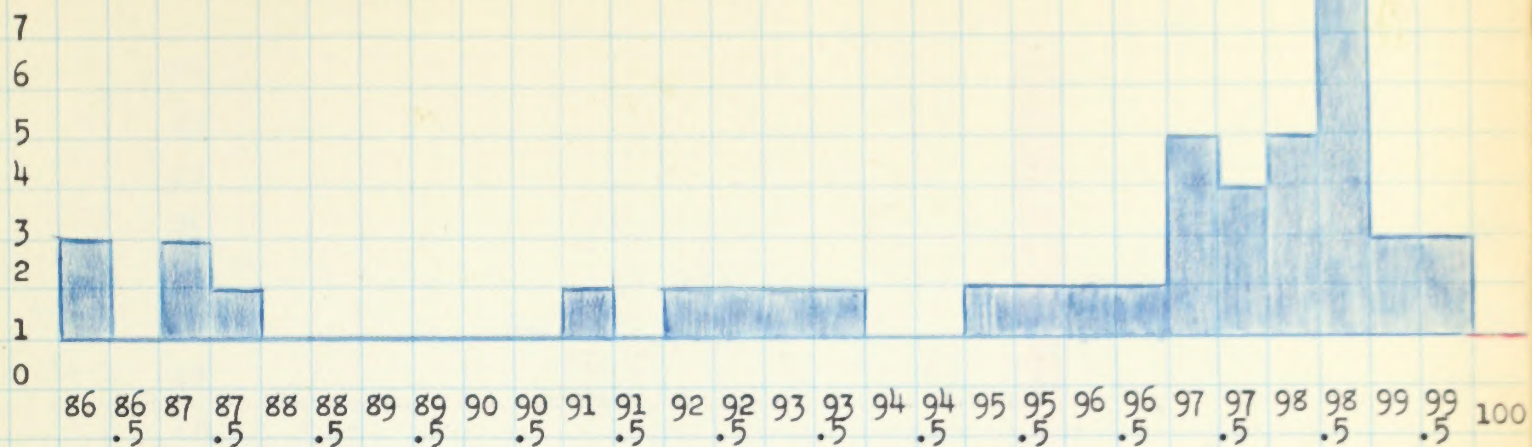


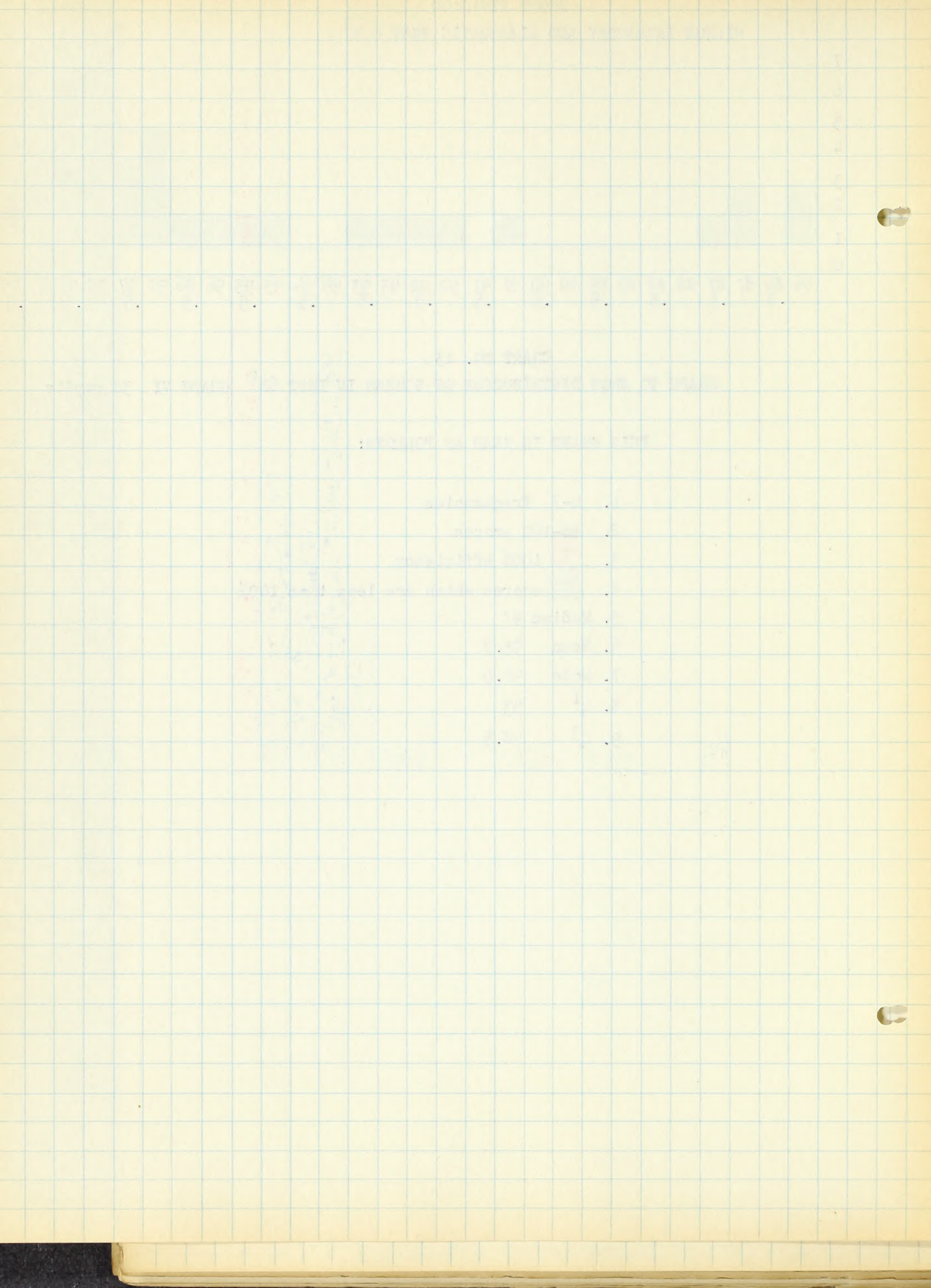
CHART NO. 13

GRAPH TO SHOW DISTRIBUTION OF SCORES IN TEST 6B<sup>2</sup> GRADE VI 38 pupils

THIS CHART IS READ AS FOLLOWS:

1. 0-7 frequencies
2. 86-100 scores
3. 100% efficiency
4. scores which are less than 100%
5. Median 97
6. Mean 95.9
7. Mode 98.5
8.  $Q^1$  93
9.  $Q^3$  98.5







## WILSON INVENTORY AND DIAGNOSTIC TEST 6 A

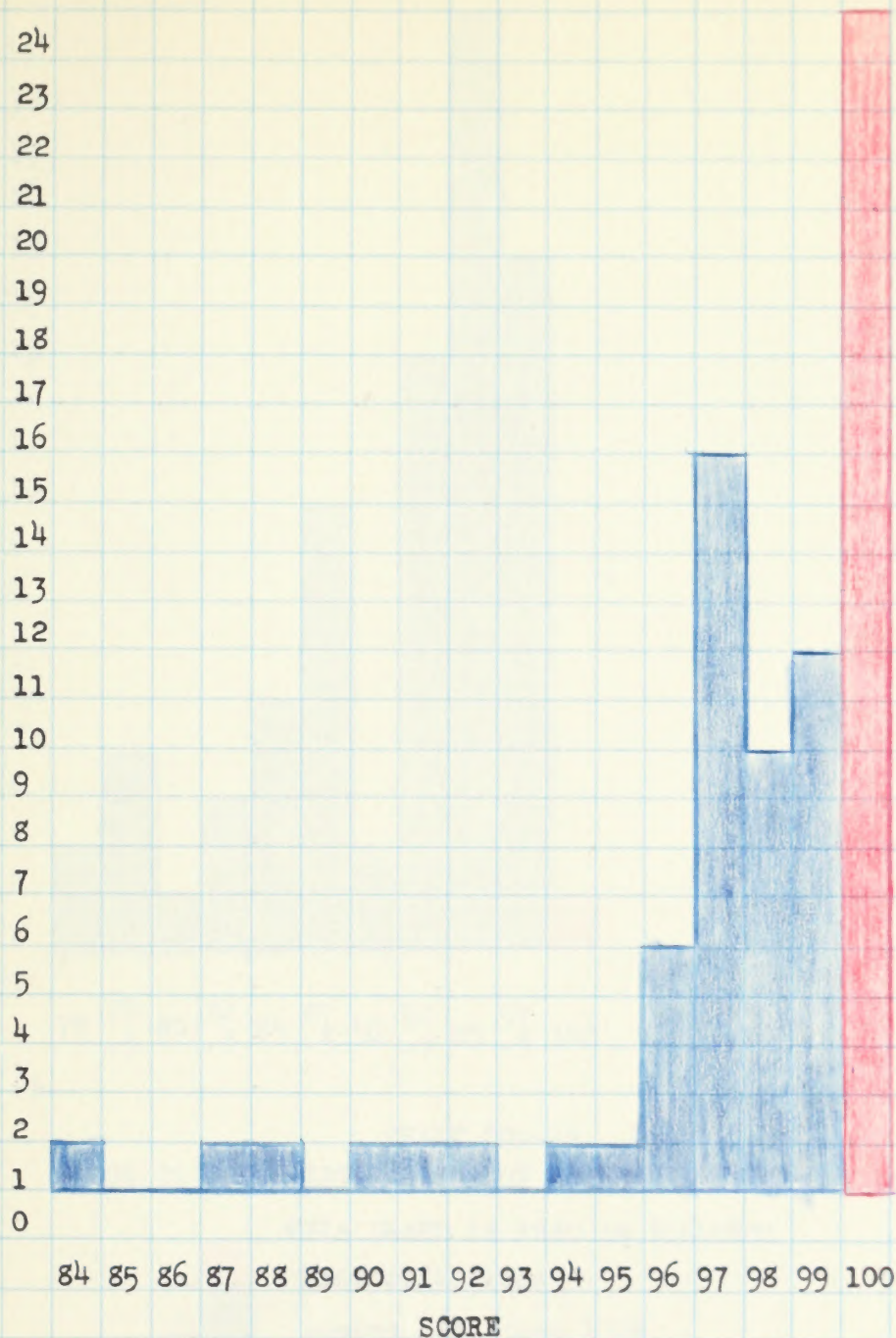


CHART NO. 14

GRAPH TO SHOW DISTRIBUTION OF SCORES IN TEST 6A

GRADE V 70 Pupils

THIS CHART IS READ AS FOLLOWS:

1. 100 efficiency
2. Scores less than 100%
3. 0-24 frequency
4. 84-100 scores
5. Median - 98
6. Mean - 97.6
7. Mode - 100
8.  $Q^1$  - 97
9.  $Q^3$  - 100







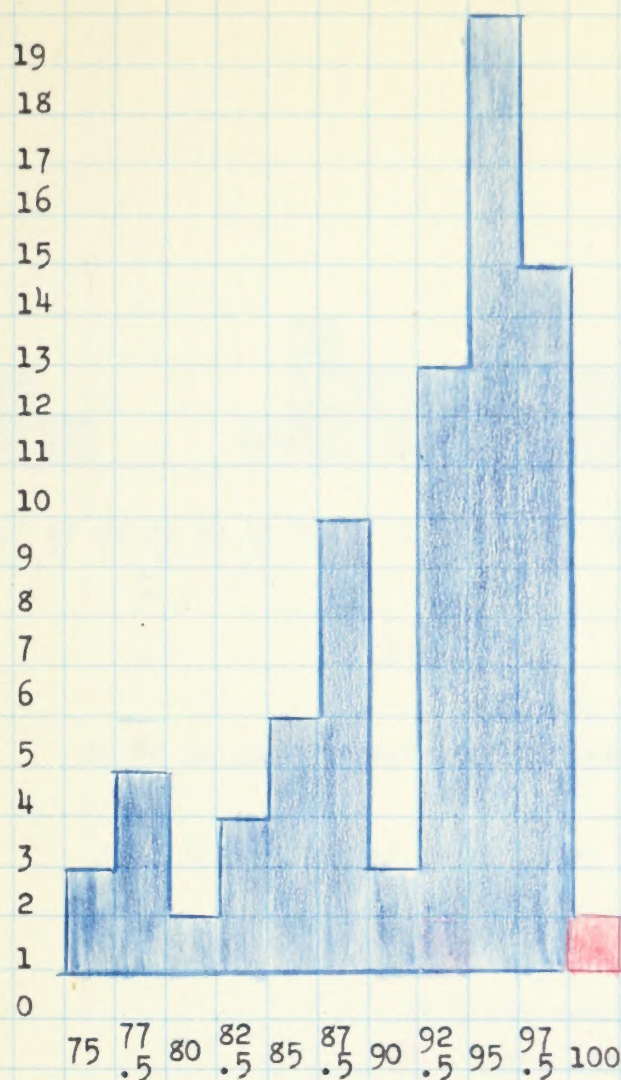
WILSON INVENTORY AND DIAGNOSTIC TEST 6B<sup>1</sup>

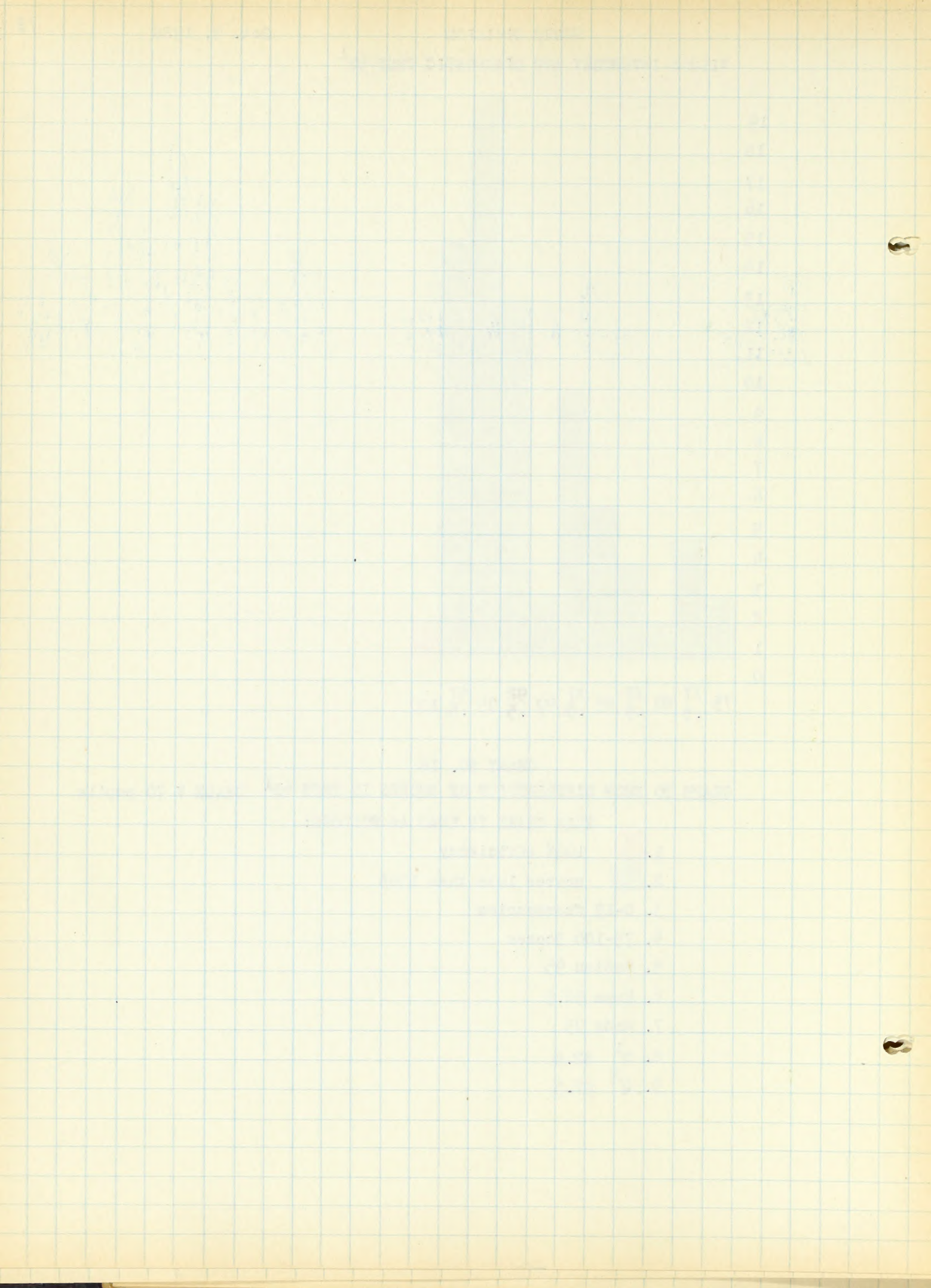
CHART NO. 15

GRAPH TO SHOW DISTRIBUTION OF SCORES IN TEST 6B<sup>1</sup> GRADE V 70 pupils

THIS CHART IS READ AS FOLLOWS:

1. 100% efficiency
2. scores less than 100%
3. 0-19 frequencies
4. 75-100 Scores
5. Median 95
6. Mean 92.5
7. Mode 95
8.  $Q^1$  82.5
9.  $Q^2$  97.5







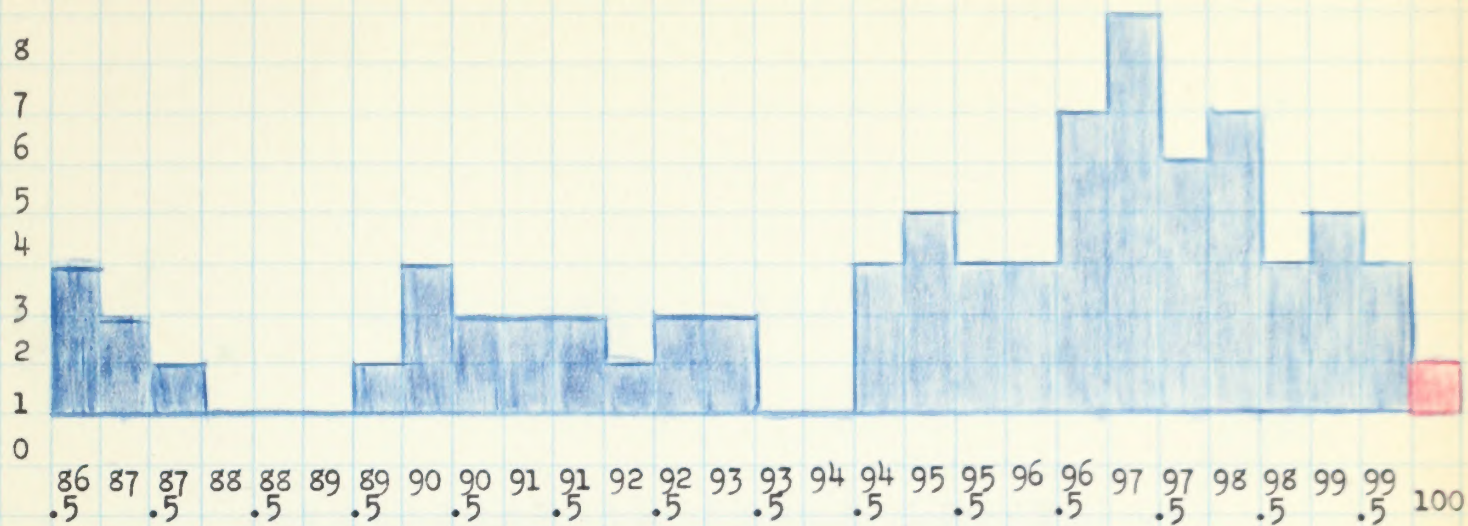
WILSON INVENTORY AND DIAGNOSTIC TEST 6B<sup>2</sup>

CHART NO. 16

GRAPH TO SHOW DISTRIBUTION OF THE SCORES IN GRADE V 70 pupils

THIS CHART IS READ AS FOLLOWS:

1. 0-8 frequencies
2. 86.5-100 scores
3.  100% efficiency
4.  scores less than 100%
5. Median 96.5
6. Mean 94.4
7. Mode 97.5
8.  $Q^1$  92
9.  $Q^3$  98



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MOTIVATED DRILL

NECESSARY TO BRING GROUPS

UP ON

SUBTRACTION & MULTIPLICATION





An inventory of the subtraction, multiplication and division test was made and the errors of each child were diagnosed. All the children agreed that they were in need of more practice-drill for accuracy and automatic responses. This drill was given by the teacher, superior children, and parents.

Realizing that teaching practice fails because of its general impracticability, the teacher went to work and found some devices to keep the children thoroughly interested and motivated.

Opportunity was furnished each pupil for skill building which aimed at ready automatic response. In order to establish the automatic responses the children made a set of flash cards numbered from 0 to 19 and a sign card for subtraction, division and multiplication. He also made another set of cards numbered from 0 to 9. With these cards the child drilled himself, or else he had another child test him on subtraction, multiplication or division. (See My Error Sheet P P <sup>192-</sup><sub>193.</sub>)

On receiving the corrected tests the children made individual sets of flash cards of their errors. These were called "Don't know cards." Thus, if a child failed on  $8 \times 0$ , he would put  $8 \times 0$  on one side of the card and 0 on the other side. Each child drilled himself, or had someone else drill him, with these cards in his spare time and at home. If he failed or was slow to make the response the card was turned over and the child repeated correctly the combination and answer.

These "Don't know Cards" were in constant use, as were the sets which were made for speed in subtraction and multiplication. The children took these cards home and received much help from their parents.

Children enjoy games, so many arithmetic games were played by the children and the teacher during the drill period. Team games where scores were kept aroused and held the interest of the children the longest.

One of the greatest aids in this work came from the cooperation of the parents, who drilled their children, using the "Don't Know Cards" and error





sheets which the children had made from the results of the tests.

One parent, who had two slow children in this work, when she saw how anxious the girls were to be efficient decided to help them. It was reported that the father, mother, and two girls played Arithmetic games for a half hour and sometimes longer at least two or three nights a week. Needless to say the results were most gratifying.

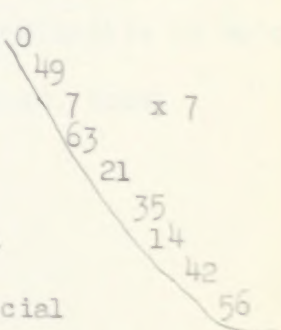
The keen interest and cooperation of the parents increased the desire in the children to become 100% efficient in the fundamentals of arithmetic. Often when a child failed, he would remark, "Oh, Boy, my Father won't like that."

The children enjoyed the drills which had been motivated into the game, and seemed to accomplish more in the five minutes allotted to the drill period than formerly. This showed that practice-drills are often failures in themselves because of their impracticability.

These daily drills or games pointed out that the surest way to prevent forgetting was to fight it day by day, using a little time on the fundamental and essential facts of subtraction, multiplication and division. The result of these short, quick and snappy practice-drills showed that these short periods given frequently were more effective for learning than were longer periods given infrequently.

#### A. Much practice was received from the Toboggan slide.

A child drew a toboggan slide on the board, and products, of the table which was to be drilled, were placed along the side as obstacles, thus



The child must go down the hill on the toboggan without falling off, thus:  $0 \times 7$  are 0;  $7 \times 7$  are 49;  $1 \times 7$  are 7;  $9 \times 7$  are 63, etc. If he failed to give the correct response, a superior child took him to the side of the room and gave him special drill on that table. If he did not fail he called on his "pal" to drag the toboggan up the slide without tipping it over.

This game greatly increased the speed and accuracy of the child and helped him to make automatic responses. It was a very good practice drill for the mul-





multiplication tables, subtraction facts and also the short division facts

B. Another race enjoyed. The class was divided into two teams, A & B. Two like lists of products were placed on the board, thus:

A 81	B 81	A child to represent each team, pointer in hand,
27	27	
72	72	stood in front of his list. A child on Team A asked $2 \times 9$ .
0	0	
36	36	Pointers gave the correct answer, the one who gave it cor-
18	18	rect first scored. If he failed, another child took his
45	45	place. On a tie both scored. A superior child acted as
9	9	
63	63	scorekeeper at the board, although an improved slow child
54	54	
90	90	

was allowed to take charge of the scores at times.

Children at their seats were anxious for their side to win, and watched carefully for errors. The child who saw the error first became the pointer for his team.

C. This game used for subtraction proved most interesting. Two lists of minuends were placed on the board thus: The subtrahend was placed in a circle be-

A 14	B 14	tween the lists. Pointers, score keepers were in their places.
9	9	
16	16	A child gave a remainder, thus: 8. Pointer indicated that
19	19	
13	13	17-9 was 8. The rules of the game were the same as those of
15	15	
10	10	Game B. From day to day the increase in speed, accuracy and
18	18	
12	12	automatic responses of certain slow individuals was very
17	17	
11	11	noticeable.

D. From the children's error sheets (see page ) the combination on which the children failed most were placed in three columns on the board, thus:

$8 \times 7$	$3 \times 5$	$4 \times 3$
$3 \times 6$	$8 \times 9$	$8 \times 6$
$9 \times 6$	$7 \times 8$	$2 \times 5$

etc. (Use 10 combinations in a column)

A child, called Master, said, "I am thinking of a combination in column (three or 1,2,3) What is it?" He called on John, who replied: "Is it  $8 \times 7 = 56$ ?" Master's response was, if wrong, "No, it is not  $8 \times 7 = 56$ " Different children were called until the correct combination was given. Score was kept of side





getting the correct combination.

This game was used also for subtraction, multiplication and division. After we had used the separate processes and felt that the classes were efficient and made accurate automatic responses, we played the same game but used the mixed fundamental essentials. This created more than ever the desire for 100% efficiency.

E. The matching game was enjoyed. Here the superior child had 6 children who matched against another superior child's six pupils for accuracy and automatic responses. Whichever side won picked the best student from the opponent's side, and he gave him the slowest pupil. The point was to have 6 pupils who were 100% efficient.

F. Mimeographed sheets containing various errors of the combination in, 1st, subtraction; 2nd, multiplication; 3rd, division; and 4th, mixed set, were prepared from the pupils of the error sheets. On these the pupils of the error group raced to see who could finish first. 100% efficiency was always the goal. Time of the race from day to day was kept so that each pupil worked to beat his own record, as well as that of the group.

G. A child made a circle with the numbers 1-12, as a circumference. In the center he put the number and process sign, thus:  
The child pointed to a number on the circumference,  
and called on another pupil who gave the product, as  
child pointed to 8 and pupil responded 40. The side  
which had largest score won. Each correct answer counted 1.

		19	
	2		4
7			11
10	x5		6
3			8
5			12
		0	

The first of these is the fact that the United States is a young nation. It is only about 150 years old, and its history is therefore a history of rapid growth and development. The second is the fact that the United States is a large nation. It covers a vast area of land, and its population is one of the largest in the world. The third is the fact that the United States is a diverse nation. It is made up of many different peoples, races, and religions, and this diversity has been one of its strengths.

The fourth is the fact that the United States is a free nation. It is a nation of free men and women, and this freedom has been one of its greatest achievements. The fifth is the fact that the United States is a powerful nation. It has a strong economy, a powerful military, and a strong influence in the world.

The sixth is the fact that the United States is a nation of opportunity. It is a nation where anyone can succeed, and this has been one of its greatest attractions. The seventh is the fact that the United States is a nation of progress. It is a nation that is always moving forward, and this has been one of its greatest strengths.

The eighth is the fact that the United States is a nation of peace. It is a nation that has been at peace for a long time, and this has been one of its greatest achievements. The ninth is the fact that the United States is a nation of justice. It is a nation where justice is done, and this has been one of its greatest strengths.

The tenth is the fact that the United States is a nation of hope. It is a nation where there is always hope for the future, and this has been one of its greatest strengths.



AMOUNT OF TIME REQUIRED  
TO ACQUIRE 100% EFFICIENCY  
  
I N

1. SUBTRACTION
2. MULTIPLICATION

GRADE V - 70 PUPILS

GRADE VI- 38 PUPILS

(See Distribution of Errors Tables No. III, LV)





AMOUNT OF TIME REQUIRED TO ACQUIRE 100% EFFICIENCY IN SUBTRACTION

(See Distribution Sheet Table No. III)

GRADE VI

Test 4 A

13 pupils failed on Test 4 A

13 pupils acquired 100% in 1 day.

Test 4 B

17 pupils failed on Test 4 B

13 pupils acquired 100% in 1 day

4 " " 100% in 2 days

Test 4 C

28 pupils failed on Test 4 C

16 pupils acquired 100% in 1 day

9 " " " 2 days

1 " " " 3 "

2 " " " 4 "





AMOUNT OF TIME REQUIRED TO ACQUIRE 100% EFFICIENCY IN SUBTRACTION

(See Distribution Sheet Table No. IV)

GRADE V

Test 4A

31 pupils failed on Test 4 A

20 pupils acquired 100% in 1 day

6 " " " 2 days

5 " " " 3 "

Test 4 B

44 pupils failed on Test 4 B

36 pupils acquired 100% in 1 day

6 " " " 2 days

2 " " " 3 "

Test 4 C

55 pupils failed on Test 4 C

34 pupils acquired 100% in 1 day

16 " " " 2 days

4 " " " 3 "

1 " " " 4 "





AMOUNT OF TIME REQUIRED TO ACQUIRE 100% EFFICIENCY IN MULTIPLICATION

(See Distribution Sheet Table No. IV)

GRADE VTest 5 A

45 pupils failed on Test 5 A

32 pupils acquired 100% in 1 day

10    "        "        "        2 days

3    "        "        "        3 "

AMOUNT OF TIME REQUIRED TO ACQUIRE 100% EFFICIENCY IN MULTIPLICATION

(See Distribution Sheet Table No. III)

GRADE VITest 5 A

23 pupils failed on Test 5 A

18 pupils acquired 100% in 1 day

3    "        "        "        2 days

2    "        "        "        3 "

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NUMBER OF MINUTES REQUIRED  
TO COMPLETE TESTS IN ARITHMETIC

SUBTRACTION

4 A, 4 B, 4 C.

MULTIPLICATION

5 A

SHORT DIVISION

6 A, 6 B<sup>1</sup>, 6 B<sup>2</sup>.

GRADE V 70 pupils

GRADE VI 38 pupils

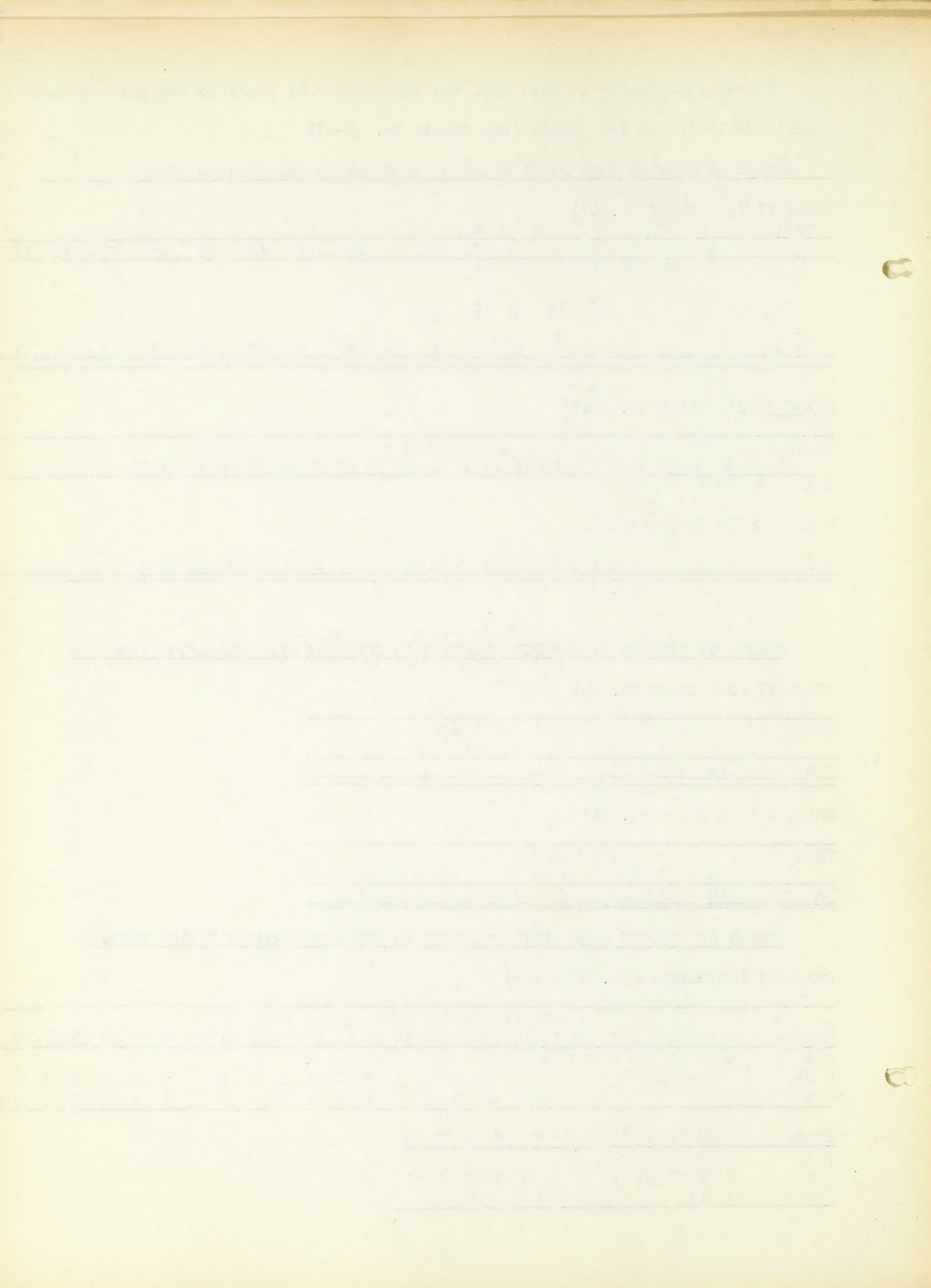
(See Distribution Sheet Tables No. III - IV)

(See Charts No. 17 - 27 )













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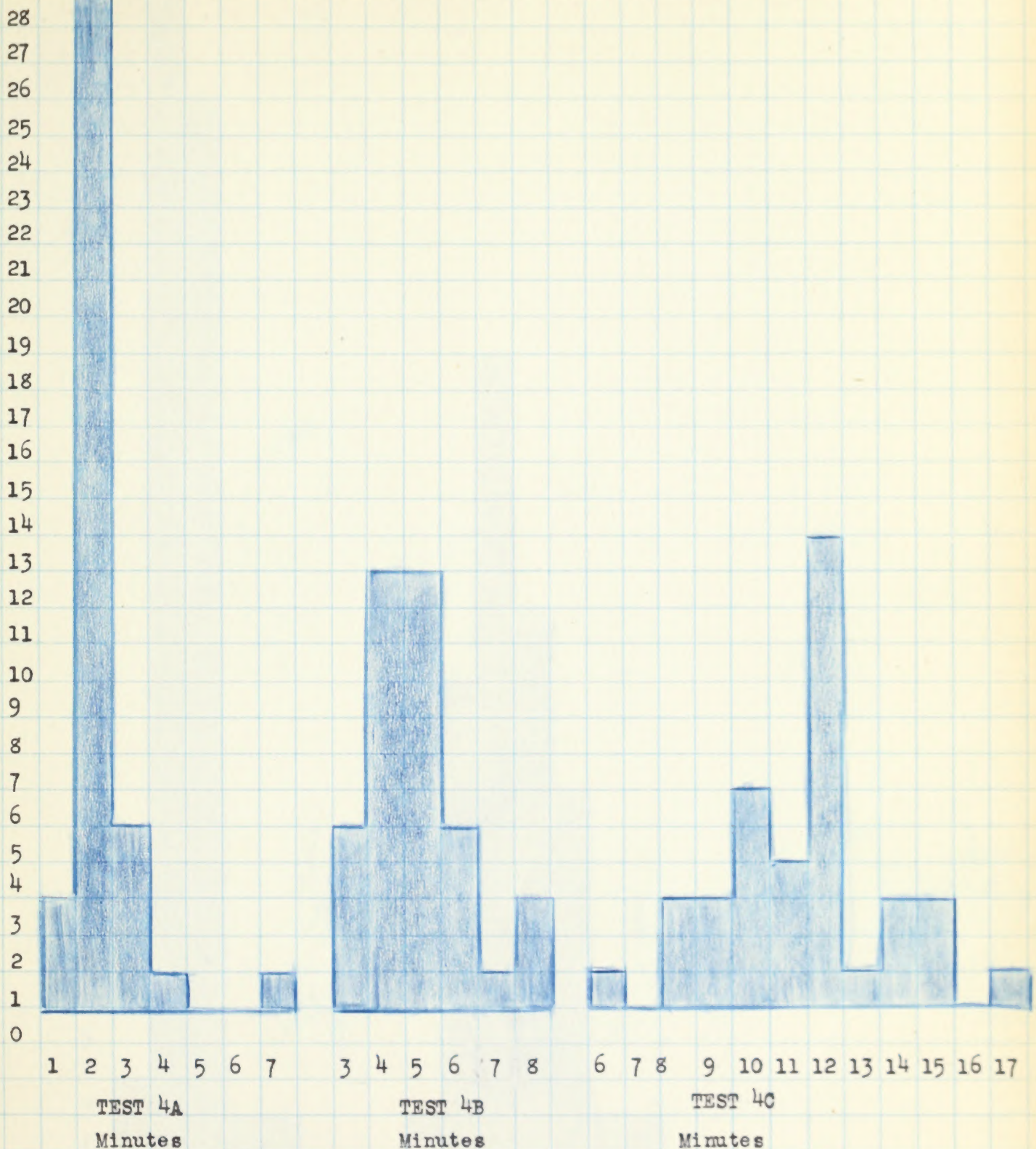
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CHART NO. 17

GRAPH TO SHOW AMOUNT OF TIME REQUIRED TO COMPLETE TEST 4A, 4B, 4C GRADE VI



THIS CHART IS READ AS FOLLOWS:

1. 0-28 frequencies
2. horizontal numbers - minutes
3. Median Test 4 A - 2 minutes  
Median Test 4 B - 5 minutes  
Median Test 4 C - 12 minutes
4.  frequencies of minutes



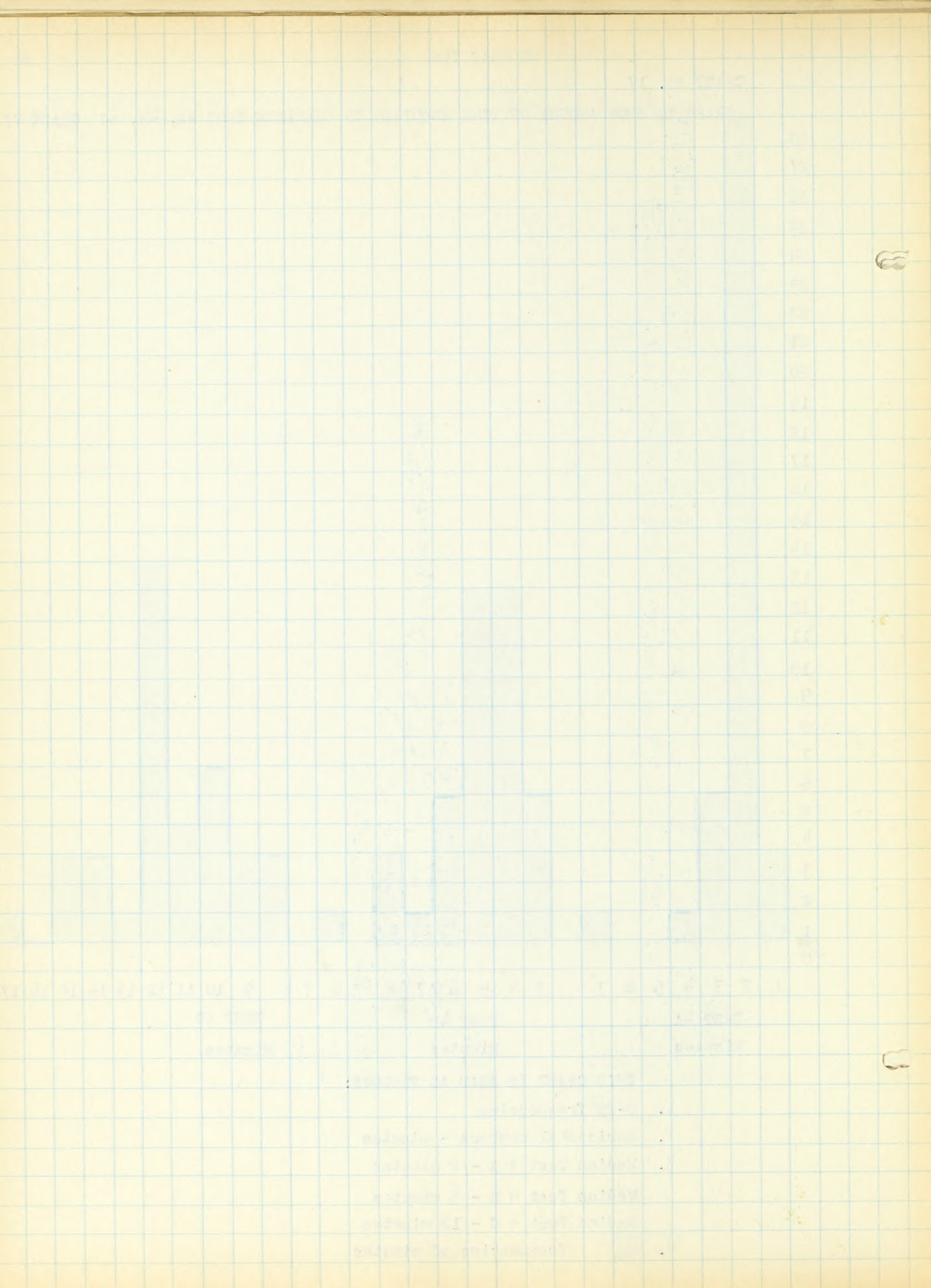
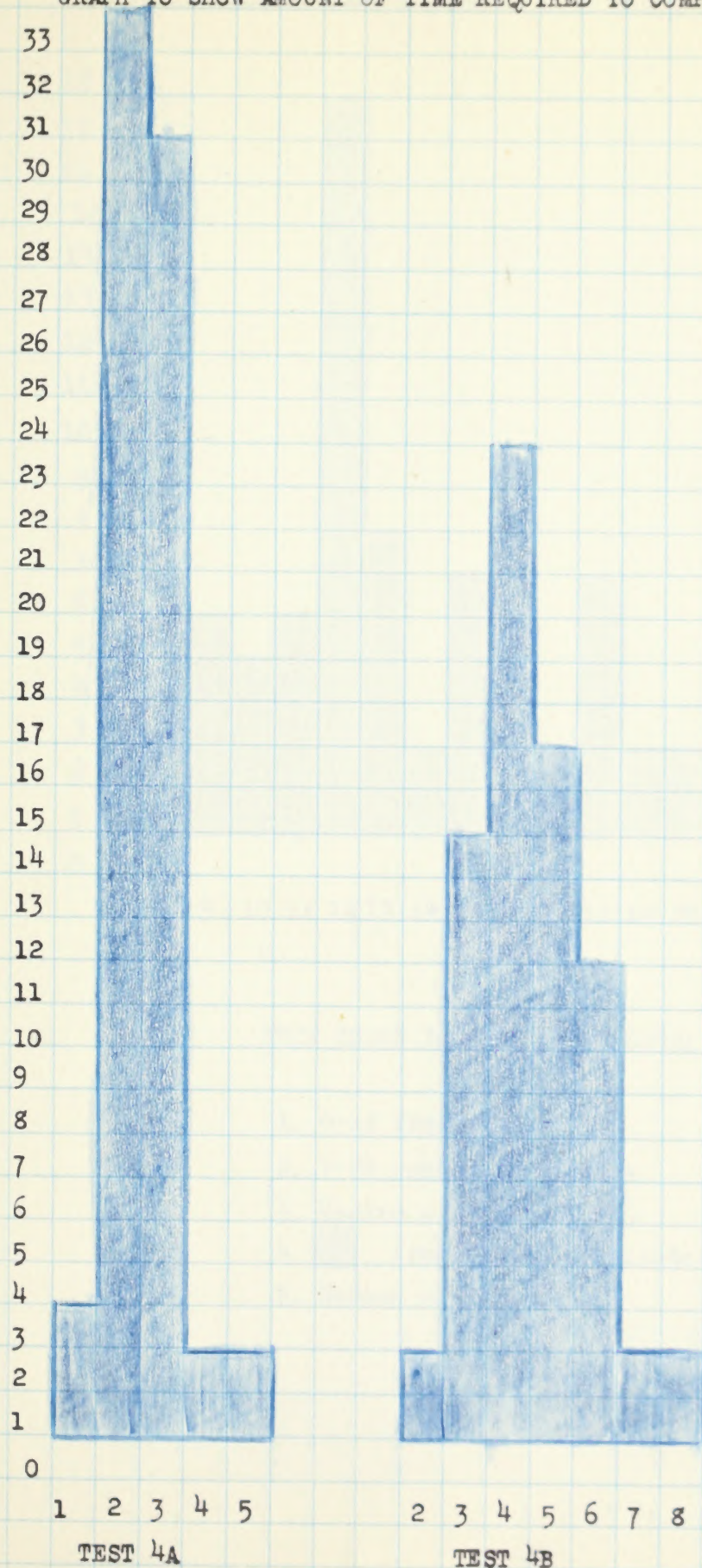


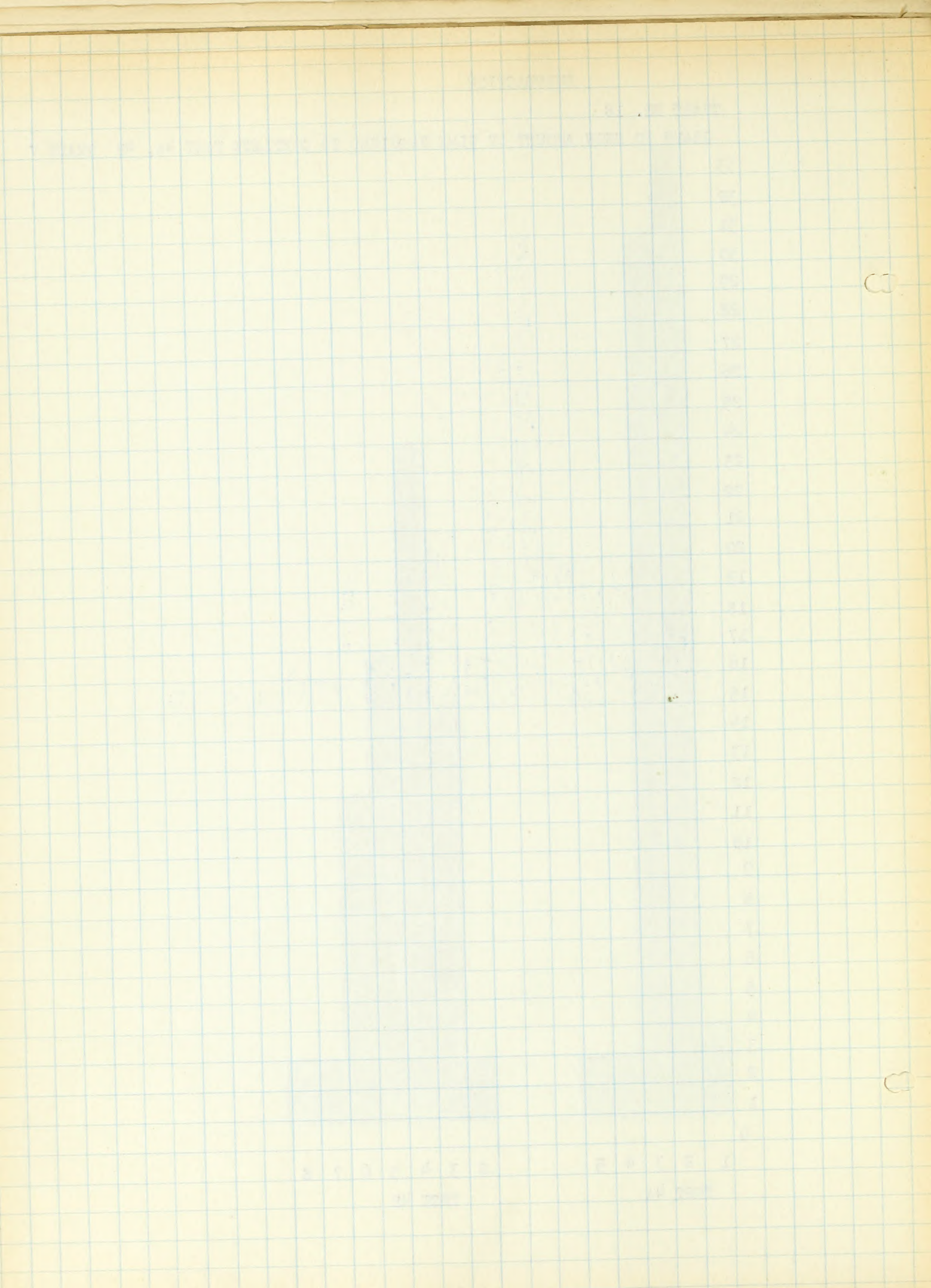


CHART NO. 18

GRAPH TO SHOW AMOUNT OF TIME REQUIRED TO COMPLETE TEST 4A, 4B GRADE V



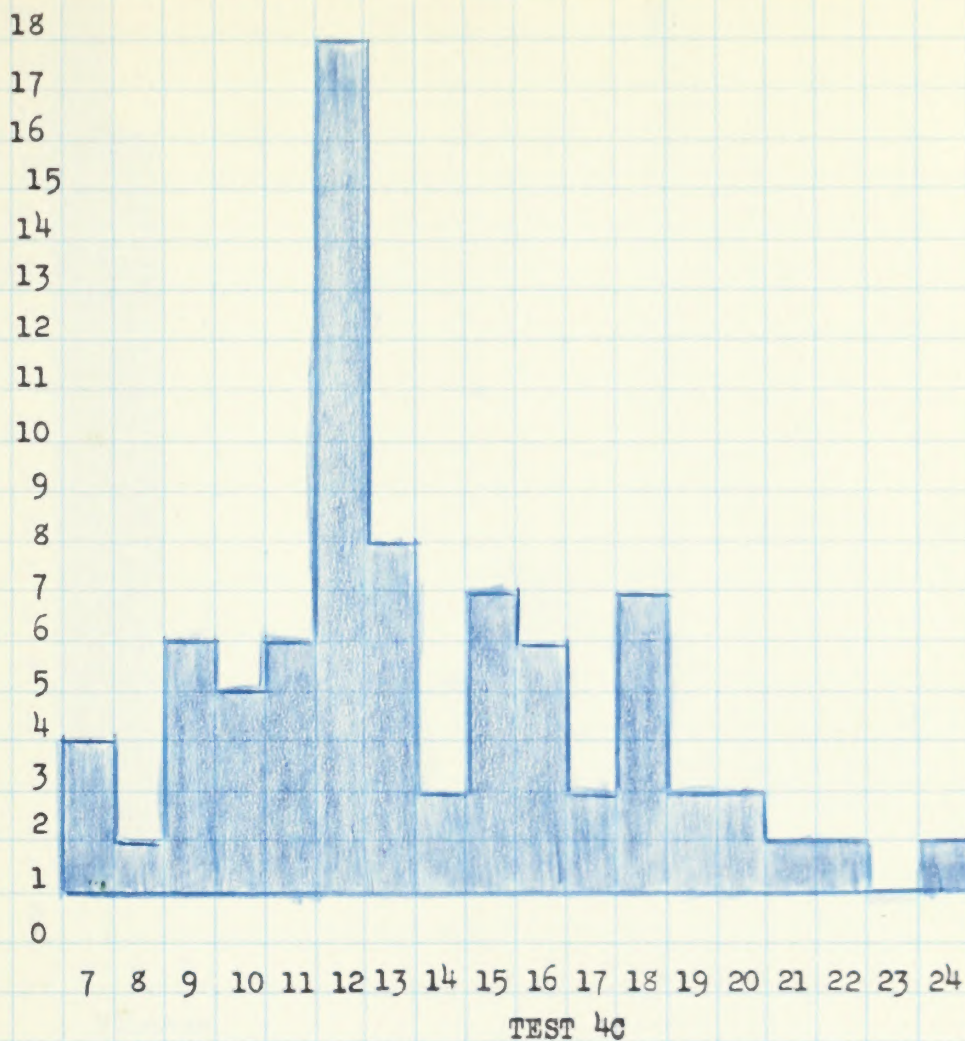






THIS CHART NO. 19

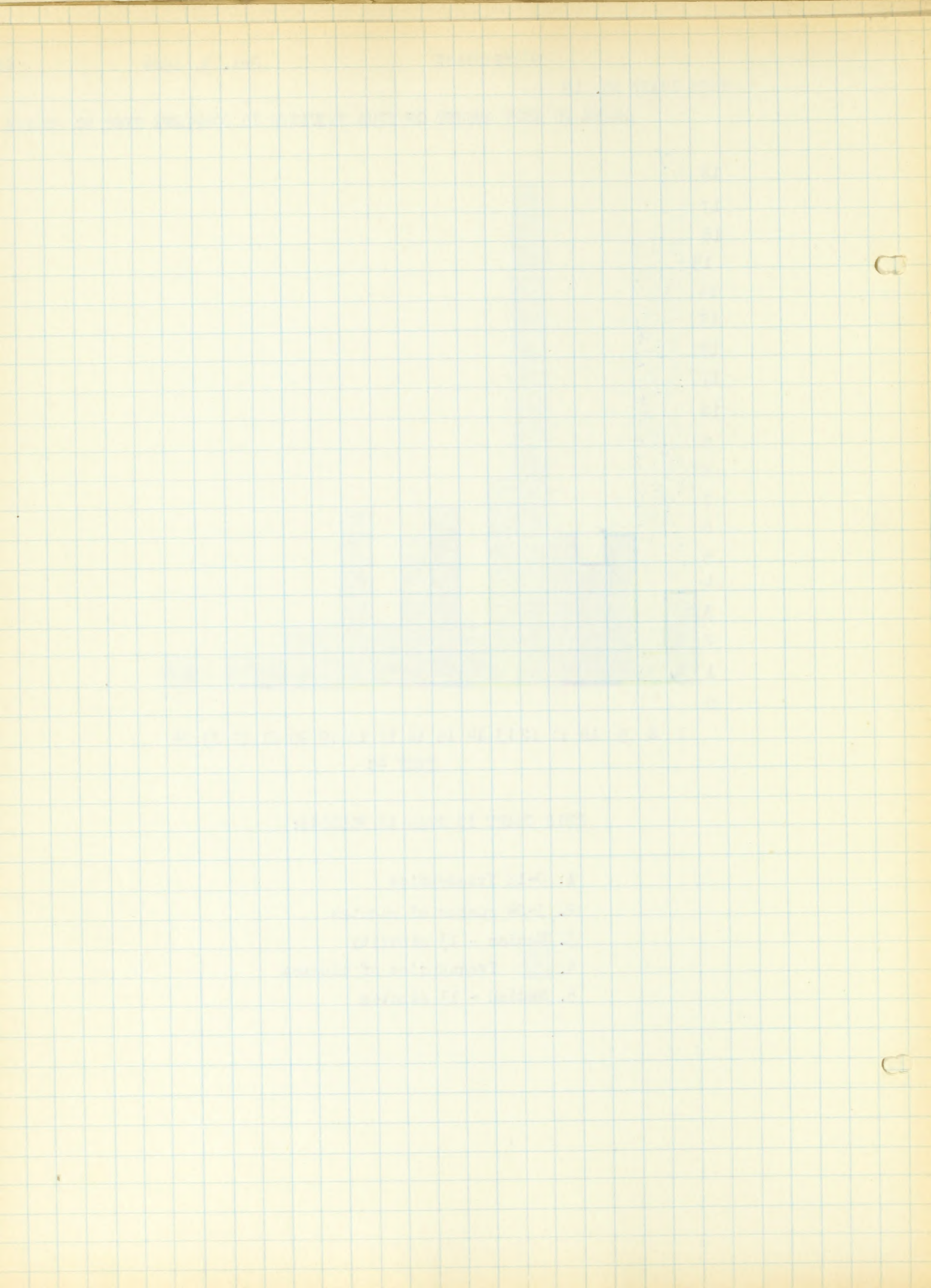
GRAPH TO SHOW AMOUNT OF TIME REQUIRED TO COMPLETE TEST 4C GRADE V



THIS CHART IS READ AS FOLLOWS:

1. 0-18 frequencies
2. 7-24 number of minutes
3. Median - 13 minority
4. [ ] frequencies of minutes
5. Median - 13 minutes



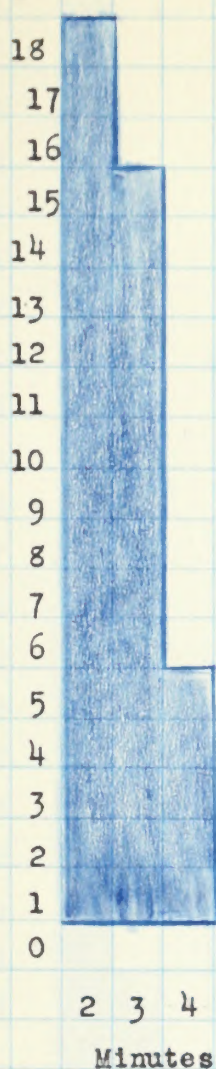




## MULTIPLICATION

CHART NO. 20

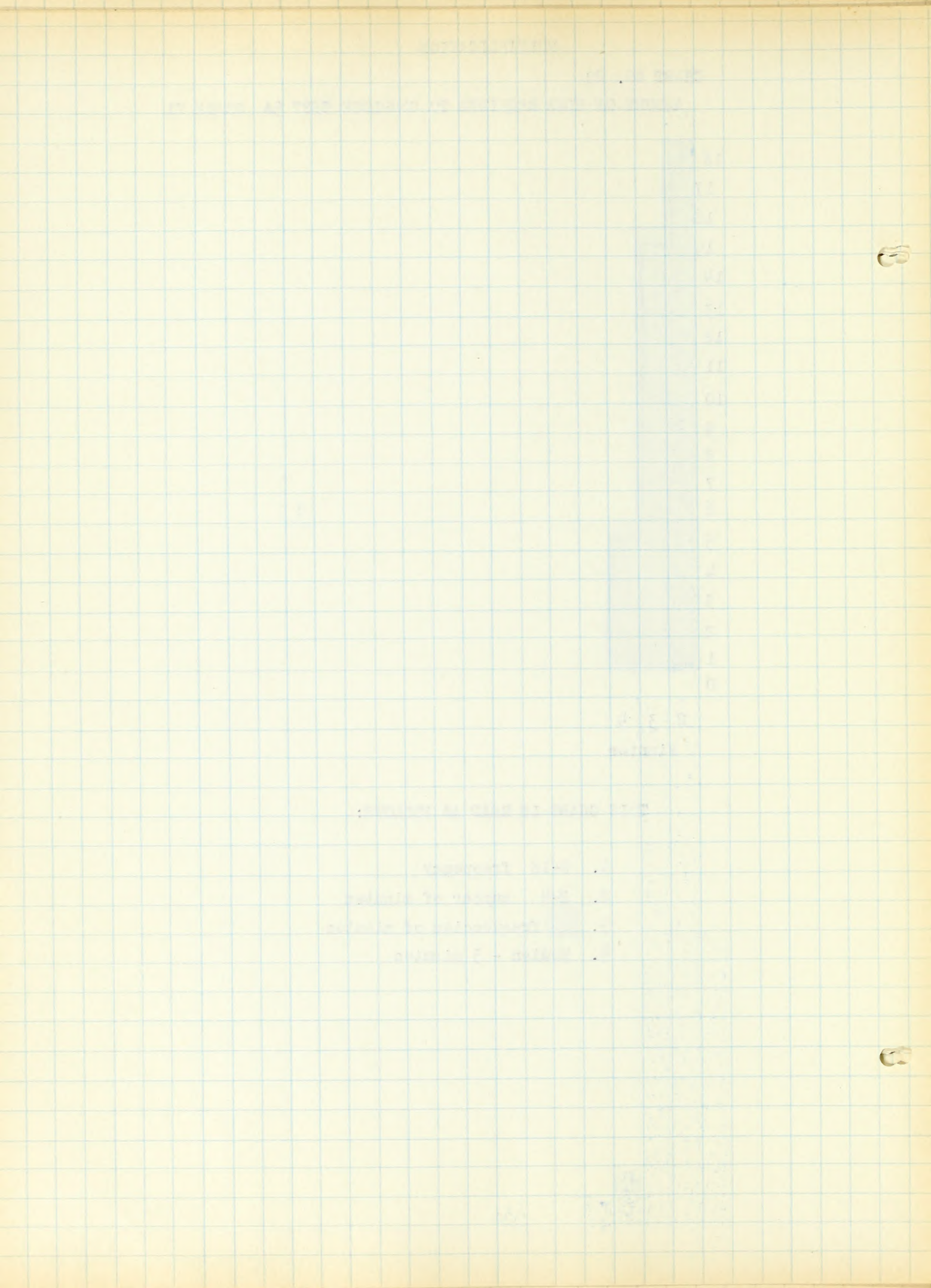
AMOUNT OF TIME REQUIRED TO COMPLETE TEST 5A GRADE VI



THIS CHART IS READ AS FOLLOWS:

1. 0-18 frequency
2. 2-4 number of minutes
3. frequencies of minutes
4. Median - 3 minutes



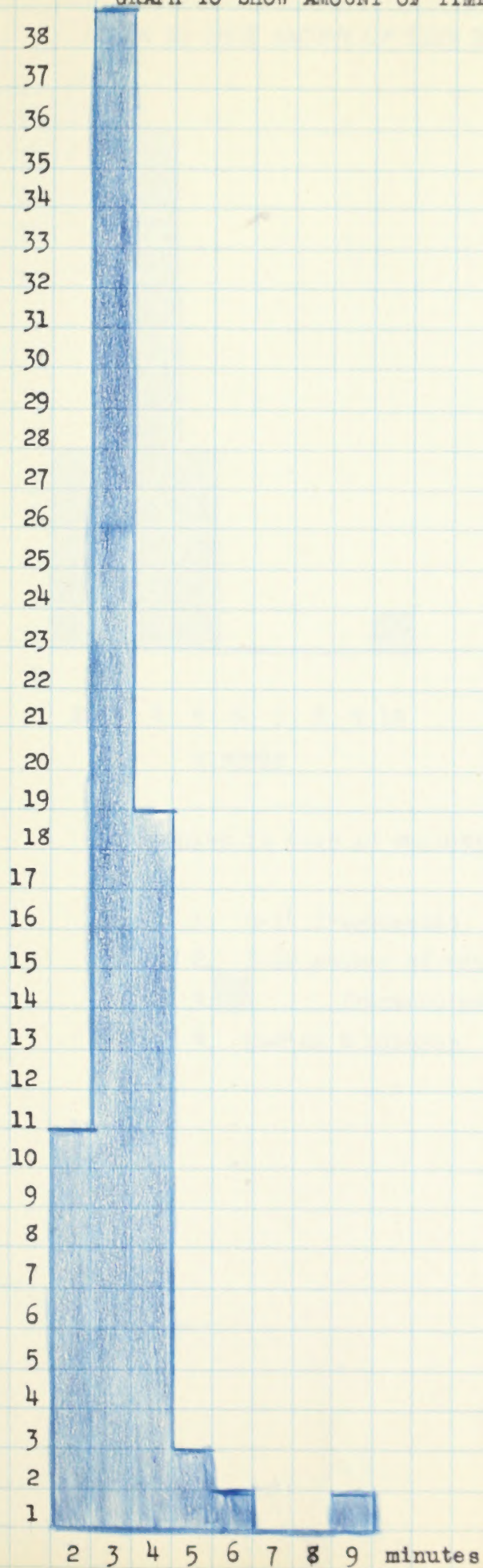




## MULTIPLICATION

CHART NO. 21

GRAPH TO SHOW AMOUNT OF TIME REQUIRED TO COMPLETE TEST 5A GRADE V.



THIS CHART IS READ AS FOLLOWS:

1. 1-38 frequencies
2. 2-9 number of minutes
3. frequencies of minutes
4. Median - 3 minutes



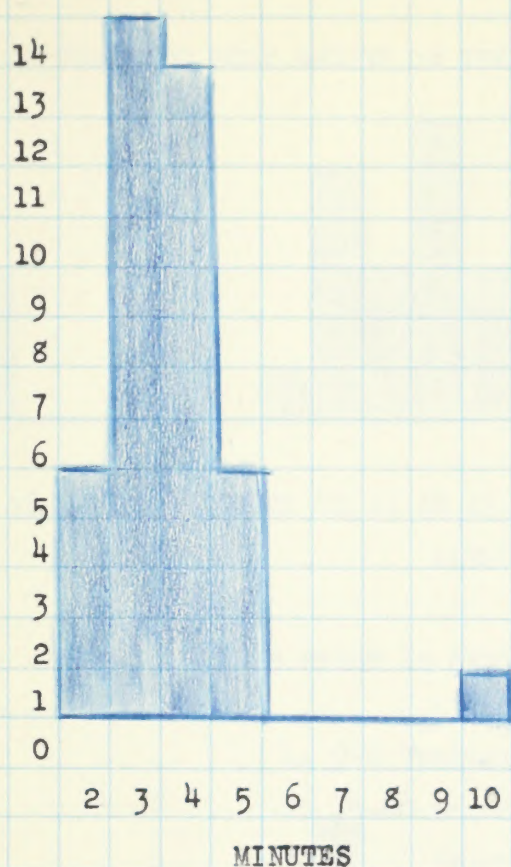




## SHORT DIVISION

CHART NO. 22

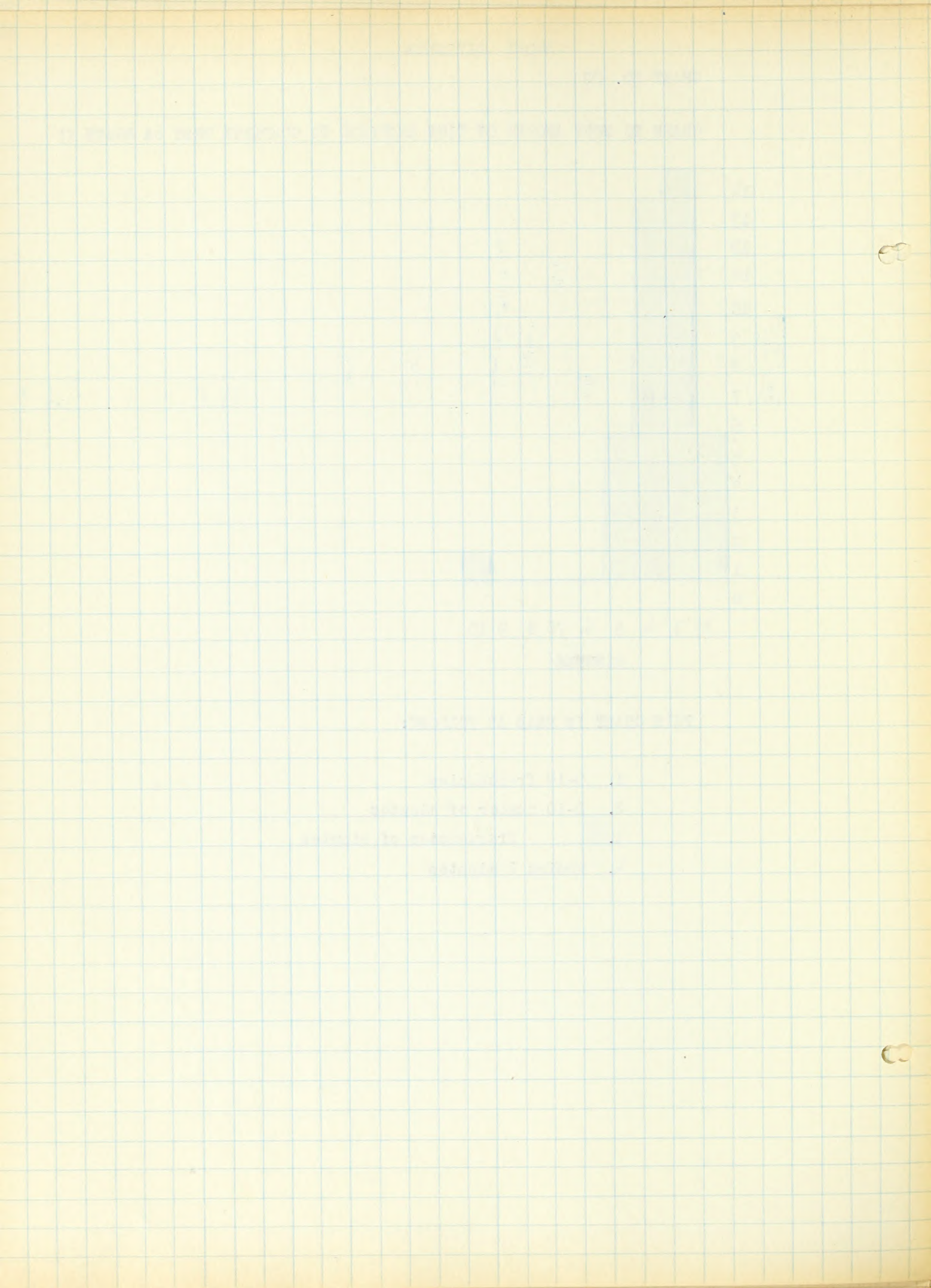
GRAPH TO SHOW AMOUNT OF TIME REQUIRED TO COMPLETE TEST 6A GRADE VI



THIS CHART IS READ AS FOLLOWS:

1. 0-14 frequencies
2. 2-10 number of minutes
3. frequencies of minutes
4. Median 2 minutes

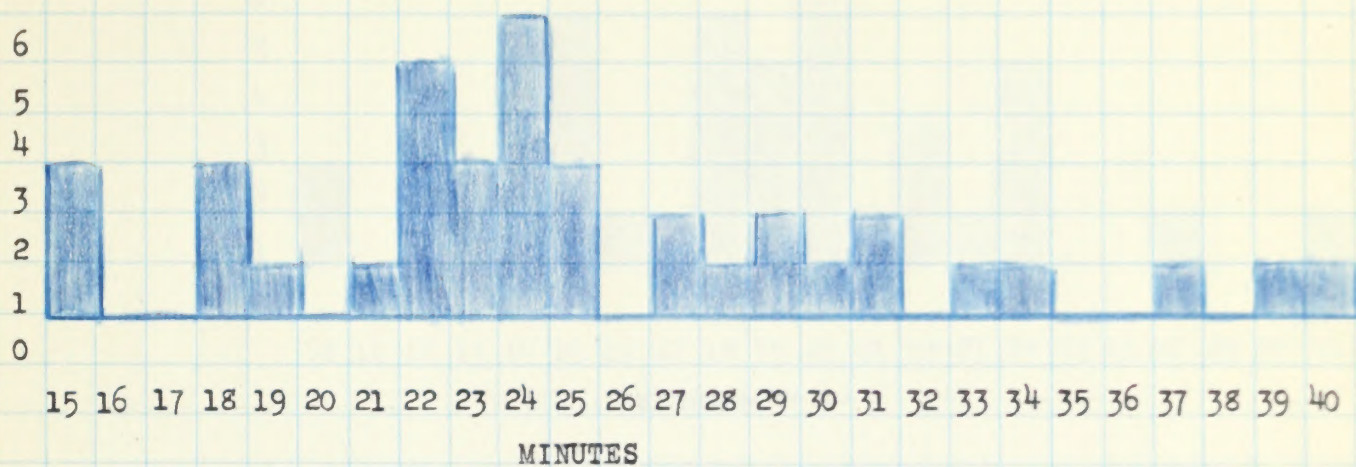






## SHORT DIVISION

CHART NO. 23

GRAPH TO SHOW AMOUNT OF TIME REQUIRED TO COMPLETE TEST 6B<sup>1</sup> GRADE VI

THIS CHART IS READ AS FOLLOWS:

1. 0-6 Frequencies
2. 15-40 Number of minutes
3. frequencies of minutes
4. Median 24

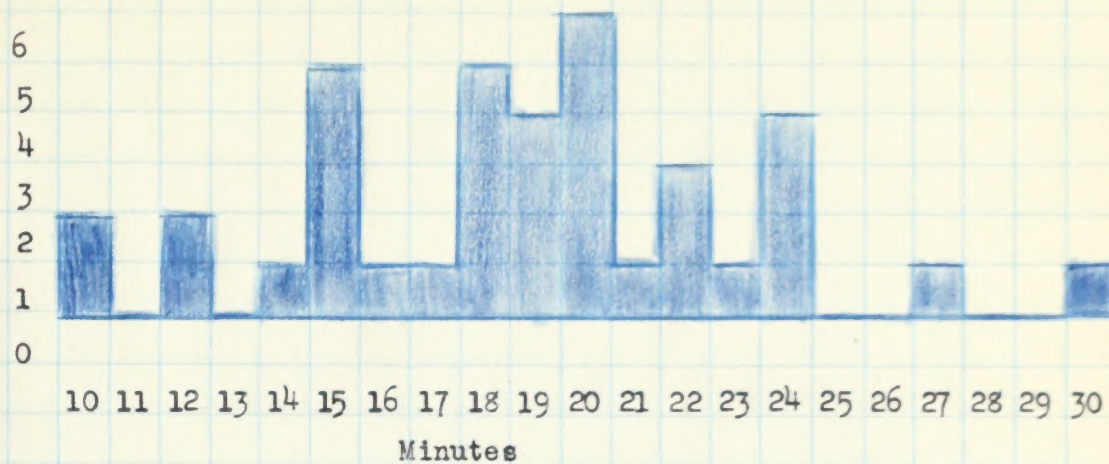






## SHORT DIVISION

CHART NO. 24

GRAPH TO SHOW AMOUNT OF TIME REQUIRED TO COMPLETE TEST 6B<sup>2</sup> GRADE VI

THIS CHART IS READ AS FOLLOWS:

1. 0-6 Frequency
2. 10-30 Number of minutes
3. Median 19
4. frequency of minutes



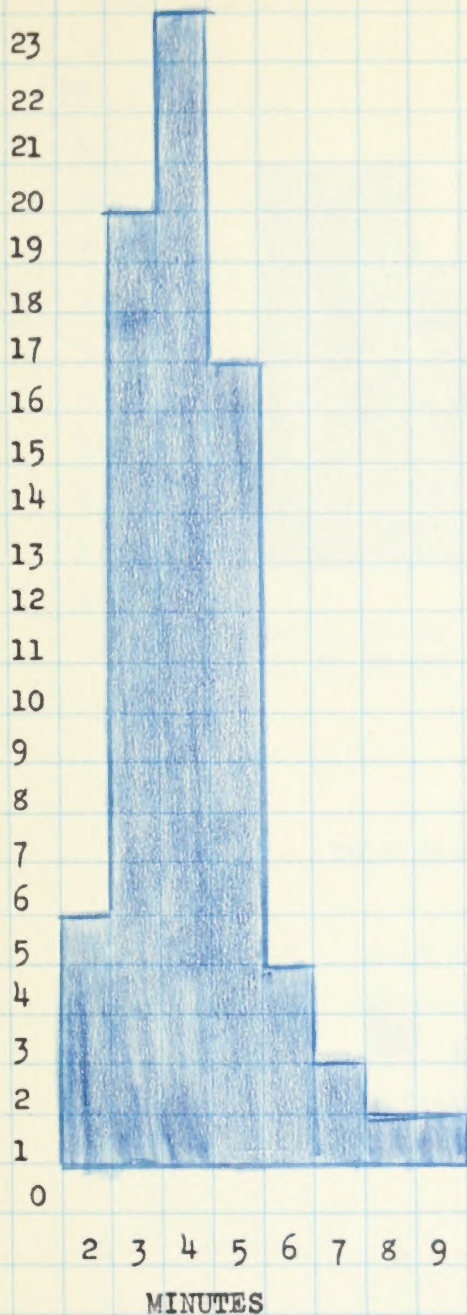





## SHORT DIVISION

CHART NO. 25

GRAPH TO SHOW AMOUNT OF TIME REQUIRED TO COMPLETE TEST 6A GRADE V



THIS CHART IS READ AS FOLLOWS:

1.  frequencies of minutes
2. 0-23 frequencies
3. 2-9 number of minutes
4. Median - 4 minutes

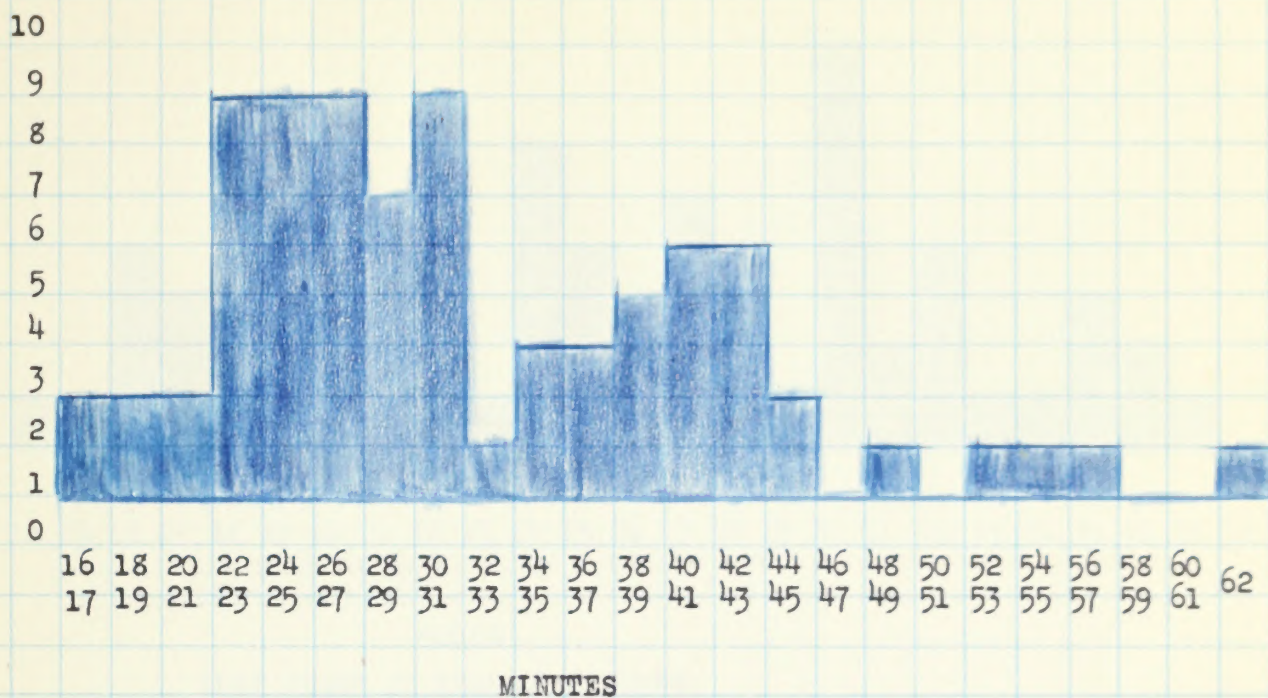






## SHORT DIVISION

CHART NO. 26

GRAPH TO SHOW AMOUNT OF TIME REQUIRED TO COMPLETE TEST 6B<sup>1</sup> GRADE V

THIS CHART IS READ AS FOLLOWS:

1. 0-10 frequencies
2. 16-62 number of minutes
3. [blue bar] frequencies of minutes
4. Median 28



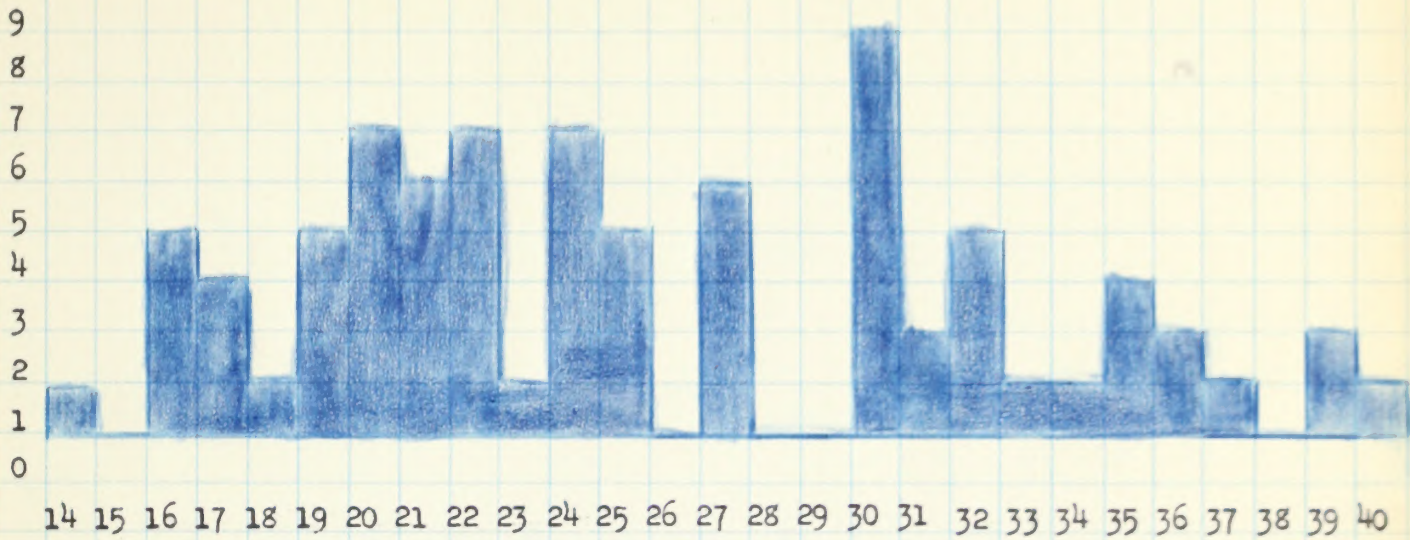




SHORT DIVISION

OCT. 10, 1928

CHART NO. 27

GRAPH TO SHOW AMOUNT OF TIME REQUIRED TO COMPLETE TEST 6B<sup>2</sup> GRADE V

SCORE

THIS CHART IS READ AS FOLLOWS:

1. 0-9 frequencies
2. 14-40 Number of minutes
3. Median 24
4. frequency of minutes







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SUMMARY TO SHOW RESULTS FROM TEST INSUBTRACTION

4 A

4 B

4 C

MULTIPLICATION

5 A

SHORT DIVISION

6 A

6 B<sup>1</sup>6 B<sup>2</sup>

CONVARY TO FROM RESULTS FROM TEST IN

SUBSTANTIATION

4A  
4B  
4C

MULTIPLICATION

5A

SHORT DIVISION

6A  
6B  
6C



S U M M A R Y

G R A D E V 70 P U P I L S

G R A D E VI 38 P U P I L S

TABLE NO. V	100% EFFICIENT PUPILS IN TESTS
" " VI	NUMBER OF PUPIL ERRORS IN TESTS
" " VII	MEDIAN OF ERRORS
" " VIII	MEAN OF CLASS ERRORS
" " IX	NUMBER OF DIFFERENT EXAMPLES FAILED ON
" " X	MOST COMMON DIFFICULTIES IN SUBTRACTION
" " XI	MOST COMMON DIFFICULTIES IN MULTIPLICATION
" " XII	MOST COMMON DIFFICULTIES IN SHORT DIVISION
" " XIII	SUMMARIZED RESULTS IN TERMS OF SCORES
" " XIV	SUMMARIZED RESULTS IN TERMS OF TIME LIMITS

(See Distribution of Errors Table No. III, IV and Charts No. 3-27)

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ALPHABETICALLY	89	89
BY SUBJECT	90	90
ALPHABETICALLY	91	91
BY SUBJECT	92	92
ALPHABETICALLY	93	93
BY SUBJECT	94	94
ALPHABETICALLY	95	95
BY SUBJECT	96	96
ALPHABETICALLY	97	97
BY SUBJECT	98	98
ALPHABETICALLY	99	99
BY SUBJECT	100	100

THE INDEX IS A GUIDE TO THE CONTENTS OF THE VOLUME



TABLE NO. V TO SHOW THE 100% EFFICIENT PUPILS IN EACH TEST BY GRADES

(See Distribution Sheet Table No. III, IV and Charts No. 3-16)

GRADE	4A	4B	4C	5A	6A	6B <sup>1</sup>	6B <sup>2</sup>
V	39	26	15	25	24	1	1
VI	25	21	10	15	13	0	0
TOTAL	64	47	25	40	37	1	1

TABLE NO. VI TO SHOW THE NUMBER OF PUPIL ERRORS IN EACH TEST BY GRADES

(See Distribution Sheet No. III, IV and Charts No. 3-16)

GRADE	4A	4B	4C	5A	6A	6B <sup>1</sup>	6B <sup>2</sup>
V	31	44	55	45	46	69	69
VI	13	17	28	23	25	38	38
TOTAL	44	61	83	68	71	107	107

TABLE NO. VII TO SHOW THE MEDIAN OF ERRORS IN EACH TEST BY GRADES

(See Distribution Sheet No. III, IV and Charts No. 3-16)

GRADE	4A	4B	4C	5A	6A	6B <sup>1</sup>	6B <sup>2</sup>
V	3.	1.	2.	2.	2.	4.	2.
VI	3.	1.	2.	2.	2.	2.	4





TABLE NO. VIII TO SHOW THE MEAN OF CLASS ERRORS IN EACH TEST BY GRADES

(See Distribution Sheet No. III, IV and Charts 3-16)

GRADE	4A	4B	4C	5A	6A	6B <sup>1</sup>	6B <sup>2</sup>
V	2.1	1.8	4.8	2.3	2.5	7.5	4.7
VI	2.7	.8	2.2	2.2	1.7	7.3	3.9

TABLE NO. IX TO SHOW THE NUMBER OF DIFFERENT EXAMPLES FAILED ON IN

EACH TEST BY GRADES

(See Distribution Sheet No. III, IV and Charts No. 3-16)

GRADE	4A (100 ex)	4B (100 ex)	4C (200 ex)	5A (100 ex)	6A (100 ex)	6B <sup>1</sup> (200 ex)	6B <sup>2</sup> (200 ex)	1000 Total
V	50	75	145	65	71	191	175	772
VI	36	28	102	52	40	109	108	475
TOTAL	96	103	247	117	111	300	283	1247

Note: Grade V - 70 pupils

Grade VI- 33 pupils

TABLE 1. SUMMARY OF DATA FOR THE FIRST TWO YEARS OF THE STUDY

(Data for 1961-1962 and 1962-1963)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1961-1962	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5
1962-1963	1.1	1.4	1.7	2.0	2.3	2.6	2.9	3.2	3.5	3.8	4.1	4.4

TABLE 2. SUMMARY OF DATA FOR THE LAST TWO YEARS OF THE STUDY

(Data for 1963-1964 and 1964-1965)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1963-1964	1.3	1.6	1.9	2.2	2.5	2.8	3.1	3.4	3.7	4.0	4.3	4.6
1964-1965	1.4	1.7	2.0	2.3	2.6	2.9	3.2	3.5	3.8	4.1	4.4	4.7

Source: Data from the study.



TABLE NO. X TO SHOW THE MOST COMMON DIFFICULTIES IN SUBTRACTION

(See Distribution Sheet Table No. I, II)

TEST 4A

Grade V

3 7 1 4 8 3 9 6 1 5  
-0 -0 -1 -0 -0 -0 -0 -0 -0 -0

Grade VI

5 8 6 1 4 9 3 2  
-0 -0 -0 -0 -0 -0 -0 -0

TEST 4B

11 12 15 11 11 10 11 13  
-4 -5 -6 -7 -3 -2 -8 -8

17 13 10 13  
-8 -7 -4 -6

13 12 14 12  
-7 -3 -8 -8

TEST 4C

78-72, 23-18, 23-16, 71-63,  
 43-36, 61-56, 33-27, 44-36,  
 19-16.

54-9, 62-54, 86-81, 89-81, 32-28,  
 23-21, 14-8, 55-49, 53-45, 70-63,  
 25-21, 35-28, 70-64, 55-48.





TABLE NO. XI TO SHOW THE MOST COMMON DIFFICULTIES IN MULTIPLICATION

(See Distribution Sheet Table No. III, IV)

TEST 5AGrade V

1 3 9 0 2 5 1 4  
 $\underline{x1}$   $\underline{x0}$   $\underline{x0}$   $\underline{x5}$   $\underline{x0}$   $\underline{x0}$   $\underline{x0}$   $\underline{x0}$

Grade VI

7 5 2 1 9 0 0 0 0  
 $\underline{x0}$   $\underline{x0}$   $\underline{x0}$   $\underline{x0}$   $\underline{x0}$   $\underline{x5}$   $\underline{x6}$   $\underline{x8}$   $\underline{x7}$

TABLE NO. XII TO SHOW THE MOST COMMON DIFFICULTIES IN SHORT DIVISION

(See Distribution Sheet Table No. III, IV)

TEST 6A

$1\overline{)1}$ ,  $1\overline{)2}$ ,  $1\overline{)3}$ ,  $1\overline{)4}$ ,  $1\overline{)6}$ ,  $1\overline{)5}$ ,  
 $1\overline{)9}$ ,  $1\overline{)7}$

$1\overline{)7}$ ,  $8\overline{)48}$ ,  $1\overline{)3}$ ,  $9\overline{)54}$

TEST 6B<sup>1</sup>

$7\overline{)5}$ ,  $7\overline{)1}$ ,  $6\overline{)53}$ ,  $7\overline{)39}$   $7\overline{)6}$ ,  $5\overline{)2}$   
 $8\overline{)3}$ ,  $7\overline{)6}$ ,  $7\overline{)0}$ ,  $6\overline{)4}$ ,  $9\overline{)2}$ ,  $8\overline{)6}$ ,  $8\overline{)0}$   
 $7\overline{)3}$ ,  $9\overline{)7}$ ,  $9\overline{)8}$ ,  $3\overline{)1}$ ,  $9\overline{)79}$ ,  $6\overline{)3}$ ,  $8\overline{)4}$   
 $4\overline{)2}$ ,  $7\overline{)4}$ ,  $8\overline{)2}$ ,  $6\overline{)5}$ ,  $4\overline{)1}$

$7\overline{)6}$ ,  $5\overline{)2}$ ,  $8\overline{)3}$ ,  $7\overline{)6}$ ,  $7\overline{)0}$ ,  $6\overline{)4}$ ,  $7\overline{)5}$ ,  
 $9\overline{)2}$ ,  $8\overline{)6}$ ,  $8\overline{)0}$ ,  $7\overline{)3}$ ,  $9\overline{)7}$ ,  $9\overline{)8}$ ,  $3\overline{)1}$ ,  
 $9\overline{)79}$ ,  $6\overline{)3}$ ,  $8\overline{)4}$ ,  $4\overline{)2}$ ,  $7\overline{)4}$ ,  $7\overline{)1}$ ,  $8\overline{)2}$   
 $6\overline{)5}$ ,  $4\overline{)1}$

TEST 6B<sup>2</sup>

$2\overline{)0}$ ,  $6\overline{)28}$ ,  $8\overline{)7}$ ,  $4\overline{)0}$ ,  $6\overline{)1}$ ,  $9\overline{)1}$ ,  $8\overline{)5}$ ,  
 $5\overline{)46}$ ,  $8\overline{)1}$ ,  $3\overline{)0}$ ,  $9\overline{)0}$ ,  $2\overline{)1}$ ,  $7\overline{)2}$

$5\overline{)0}$ ,  $6\overline{)2}$ ,  $9\overline{)1}$ ,  $3\overline{)2}$ ,  $2\overline{)0}$ ,  $9\overline{)3}$ ,  $6\overline{)1}$   
 $9\overline{)0}$ ,  $9\overline{)89}$ ,  $7\overline{)2}$ ,  $8\overline{)50}$ ,  $6\overline{)0}$ ,  $9\overline{)4}$ ,  
 $4\overline{)3}$ ,  $3\overline{)0}$ ,  $9\overline{)6}$ ,  $5\overline{)1}$





TABLE NO. XIII SUMMARIZED RESULTS IN TERMS OF SCORES BY GRADE

(See Distribution Sheet No. III Charts No. 1-16)

GRADE VI Median, Mean, Mode,  $Q^1$ ,  $Q^3$ , Range of Scores

TEST	Range of Scores	Median	Mean	Mode	$Q^1$	$Q^3$
4 A	82-100	100	97.3	100	98	100
4 B	95-100	100	99.1	100	99	100
4 C	73.5-100	99	98.2	100	97.5	100
5 A	75-100	99	94.7	100	97	100
6 A	89-100	99	98.0	100	98	100
6B <sup>1</sup>	74.5-100	91	91.0	87.5-89.5	87.5-89.5	95-97
6B <sup>2</sup>	84.5-100	97	95.9	98.5	93	98.5

GRADE V (See Distribution Sheet No. IV Charts No. 1-16)

TEST	RANGE OF SCORES	MEDIAN	MEAN	MODE	$Q^1$	$Q^3$
4 A	87-100	100	98.7	100	99	100
4 B	81-100	99	98.1	100	98	100
4 C	71.5-100	98	96.3	99.5	95.5	99.5
5 A	83-100	100	97.6	100	98	100
6 A	84-100	98	97.6	100	97	100
6 B <sup>1</sup>	75-100	95	90.5	95	82.5	97.5
6 B <sup>2</sup>	83-100	86.5	89.4	97.5	92	98





TABLE NO. XIV SUMMARIZED RESULTS IN TERMS OF TIME LIMITS BY GRADE

GRADE VI (See Charts No. 17 - 27)

TEST	RANGE OF MINUTES	MEDIAN	MODE	Q <sup>1</sup>	Q <sup>3</sup>
4 A	1-7	2	2	2	2
4 B	3-8	5	4-5	4	6
4 C	6-17	12	12	10	13
5 A	2-3	3	2	2	3
6 A	2-10	2	3	3	4
6 B <sup>1</sup>	15-40	24	24	22	29
6 B <sup>2</sup>	10-30	19	20	15	22

GRADE V (See Charts No. 17 - 27)

TEST	RANGE OF MINUTES	MEDIAN	MODE	Q <sup>1</sup>	Q <sup>3</sup>
4 A	1-5	2	2	2	3
4 B	2-8	4	4	4	5
4 C	7-24	13	12	11	16
5 A	2-9	3	3	3	4
6 A	2-9	4	4	3	5
6 B <sup>1</sup>	16-62	28	20, 26, 30	24	38
6 B <sup>2</sup>	14-40	24	30	20	30





ANALYSIS OF THE  
PROCESSES INVOLVED IN  
THE WORK BOOK AND DRILL SERVICE

BY

G. M. WILSON

TABLES NO. XV<sup>a</sup> - XVI<sup>a</sup>

1. SUBTRACTION

2. MULTIPLICATION

3. SUMMARY

RECEIVED

RECEIVED

RECEIVED

RECEIVED

RECEIVED

RECEIVED

RECEIVED

RECEIVED



The Work Book and Service Drill in Long Division by G M Wilson contained four hundred eighty seven (487) examples graded according to their difficulties into ten (10) groups under two rules.

Rule I was made up of Groups 1-9 and exceptions. Group 10 and exceptions made up Rule II.

Number of Examples Each Group

GROUP	NO.	EXAMPLES	RULE		GROUP	NO.	EXAMPLES	RULE
I	110		I	:	VII	28		I
II	110		I	:	VIII	20		I
III	35		I	:	IX	22		I
IV	24		I	:	Exceptions	26		I
V	21		I	:	X	73		II
VI	24		I	:	Exceptions	94		II

Total 487 Examples. Rule I - 320 Examples. Rule II - 167 Examples.

It was surprising the amount of actual practice-drill in fundamental facts of subtraction and multiplication that was received by the pupils using the Work Book and Drill Service.

By looking at the following tables you will be interested to note that the process of subtraction was used 3181 times, and the process of multiplication was used 4686 times.

Closer inspection shows the number of times the numbers zero to nineteen (0-19) were used as a minuend or a subtrahend in subtraction.

NO.	USED AS A MINUEND	USED AS A SUBTRAHEND	:	NO.	USED AS A MINUEND	USED AS A SUBTRAHEND
0	91	1203	:	5	235	198
1	349	525	:	6	323	351
2	366	632	:	7	248	146
3	315	357	:	8	281	226
4	310	401	:	9	245	142

The following table shows the results of the analysis of the data obtained from the experiments conducted on the effect of the concentration of the solution on the rate of reaction. The results are given in the following table:

Concentration of solution (M)	Rate of reaction (mol/l.s)	Concentration of solution (M)	Rate of reaction (mol/l.s)
0.1	0.001	0.2	0.002
0.2	0.002	0.3	0.003
0.3	0.003	0.4	0.004
0.4	0.004	0.5	0.005
0.5	0.005	0.6	0.006
0.6	0.006	0.7	0.007
0.7	0.007	0.8	0.008
0.8	0.008	0.9	0.009
0.9	0.009	1.0	0.010

It is seen from the above table that the rate of reaction increases with the concentration of the solution. This is due to the fact that as the concentration of the solution increases, the number of molecules of the reactants per unit volume increases, and hence the probability of collision between the molecules increases. This leads to an increase in the rate of reaction.

Concentration of solution (M)	Rate of reaction (mol/l.s)	Concentration of solution (M)	Rate of reaction (mol/l.s)
0.1	0.001	0.2	0.002
0.2	0.002	0.3	0.003
0.3	0.003	0.4	0.004
0.4	0.004	0.5	0.005
0.5	0.005	0.6	0.006
0.6	0.006	0.7	0.007
0.7	0.007	0.8	0.008
0.8	0.008	0.9	0.009
0.9	0.009	1.0	0.010



NO.	USED AS A MINUEND	USED AS A SUBTRAHEND	:	NO.	USED AS A MINUEND	USED AS A SUBTRAHEND
10	164	0	:	15	16	0
11	82	0	:	16	9	0
12	61	0	:	17	17	0
13	41	0	:	18	0	0
14	27	0	:	19	0	0
TOTALS					3181	3181

In the Multiplication tables you will note the number of times that the numbers zero to nine ( 0 to 9 ) were used as a multiplier and multiplicand.

NO.	MULTIPLIER	MULTIPLICAND
0	198	198
1	1154	1154
2	904	904
3	686	686
4	377	377
5	328	328
6	290	290
7	280	280
8	267	267
9	202	202
TOTALS	4686	4686

See following tables showing the distribution in the different groups  
(Tables No. <sup>XVI</sup><sub>XVII</sub> )





C H A R T XVI (1-29)

SUBTRACTION PROCESS IN THE

LONG DIVISION WORK BOOK AND DRILL SERVICE

C H A R T XVII (1-42)

MULTIPLICATION PROCESS IN THE

LONG DIVISION WORK BOOK AND DRILL SERVICE





S U B T R A C T I O N







## SUBTRACTIONS

## KEY TO THE WORK

- A. Top horizontal number = minuend.
- B. Lower horizontal numbers = total number of times that each number is used as a minuend
- C. Left vertical numbers = subtrahend.
- D. Right vertical numbers = total number of times that each number is used as a subtrahend.







## SUBTRACTIONS

Page 6

I													D												
Group 1													C												
A	C	0	1	2	3	4	5	6	7	8	9	To- tal	A	C	0	1	2	3	4	5	6	7	8	9	To- tal
0													0												
1												26	1		16	3	5	2							26
2												32	2		19	2	3	4	1	1	2			32	
3												32	3		25	1	1	5						32	
4												10	4			7					2	1	10		
5													5					4						4	
6												4	6						3			1	4		
To- tal													To- tal												
B	C	0	16	22	32	13	9	9	1	4	2	108	B	C	0	16	22	32	13	9	9	1	4	2	108

Group 2												D	C													D
A	C	0	1	2	3	4	5	6	7	8	9	To- tal	A	C	0	1	2	3	4	5	6	7	8	9	To- tal	
	0	"										2		0	2										2	
	1								"		"	21		1		4		10		3		2		2	21	
	2											27		2			23		4						27	
	3				"							2		3				2							2	
	4											8		4					8						8	
	5											0		5											0	
	6							"				2		6						2					2	
	7											0		7											0	
	8									"		2		8									2		2	
To- tal													To- tal													
B	C	2	4	23	12	12	3	2	2	2	2	64	B	C	2	4	23	12	12	3	2	2	2	2	64	

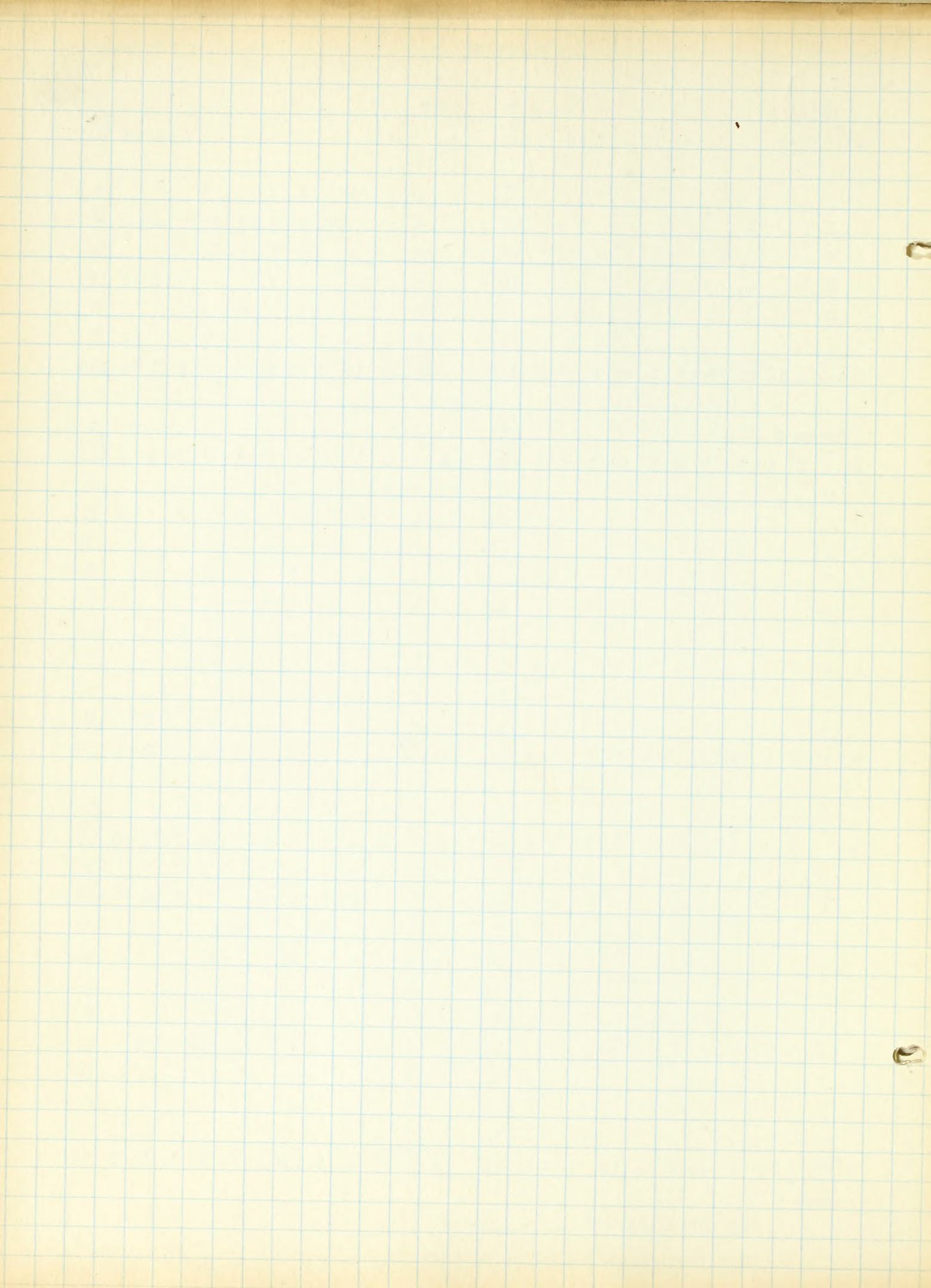
Group 3												D													D
A	C	0	1	2	3	4	5	6	7	8	9	To- tal	A	C	0	1	2	3	4	5	6	7	8	9	To- tal
	0	"										2		0	2										2
	1											20		1		5		2	6			3	4		20
	2						"					7		2			5			2					7
	3								"			14		3				12			2				14
	4											0		4											0
	5											0		5											0
	6											11		6							10		1		11
	7											0		7											0
	8											0		8											0
	9										"	2		9										2	2
To- tal													To- tal												
B	C	2	5	5	14	6	2	12	3	5	2	56	B	C	2	5	5	14	6	2	12	3	5	2	56

NOTE

Top Horizontal numbers = minuend

Left Vertical numbers = subtrahend







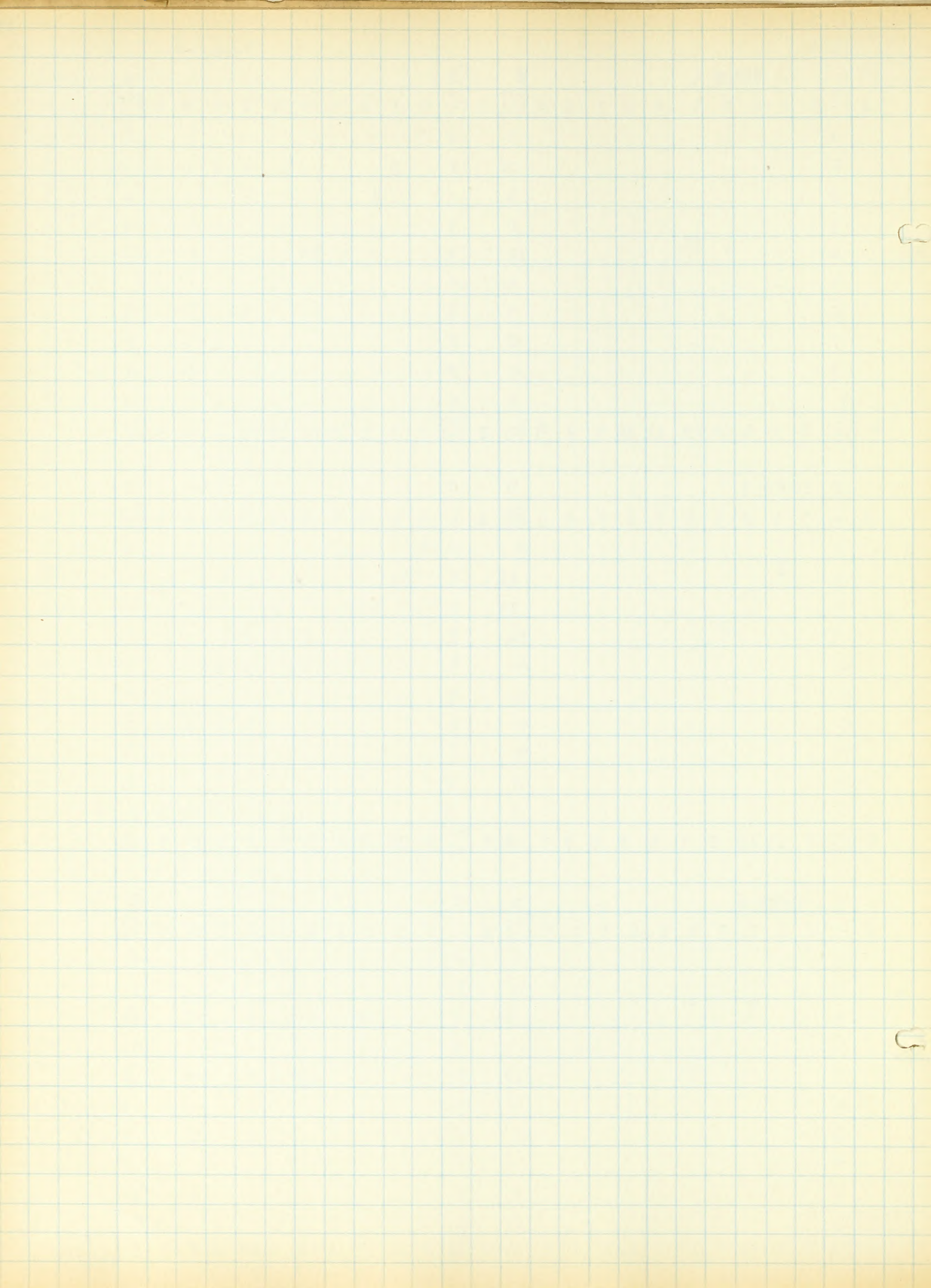
Page 6-7

	I													Page 6-7												
		GROUP 4										D		C											D	
A	C	0	1	2	3	4	5	6	7	8	9	To- tal	A	-	0	1	2	3	4	5	6	7	8	9	To- tal	
	0	"										2		0	2										2	
	1	+++ +++	+++ +++				+++ +++	+++ +++	"	"	+++ +++	26		1		9				5	4	2	1	5	26	
	2							+++ +++				4		2			1				3				4	
	3											0		3											0	
	4					+++ +++						12		4					12						12	
	5						+++ +++					6		5						6					6	
	6							+++ +++				3		6							3				3	
	7								+++ +++			2		7								2			2	
	8									+++ +++		7		8									7		7	
	9											0		9											0	
B	To- tal		2	9	1	0	12	11	10	4	8	5	62	B	To- tal	2	9	1	0	12	11	10	4	8	5	62

C GROUP 5												D	C	D											
A	-	0	1	2	3	4	5	6	7	8	9	Total	A	-	0	1	2	3	4	5	6	7	8	9	Total
	0	'''										4		0	4										4
	1	'''										11		1	11										11
	2	'''										13		2			12			1					13
	3			'''	''	''	''					14		3				8	2	2	2				14
	4							'''				5		4					1		3	1			5
	5											0		5											0
	6							'''	'''	''	''	9		6							3	4	1	1	9
	7											0		7											0
	8										''	0		8											0
	9											2		9									2	2	
B	Total	4	11	12	8	3	3	8	5	1	3	58	B	Total	4	11	12	8	3	3	8	5	1	3	58

GROUP 6													D														D
A	-	0	1	2	3	4	5	6	7	8	9	To- tal	A	-	0	1	2	3	4	5	6	7	8	9	To- tal		
	0	+++ +++										6		0	6										6		
	1											0		1											0		
	2	+++ +++ +++			+++ +++	+++ +++		+++ +++		+++ +++		24		2			15		4		3		2		24		
	3											0		3											0		
	4				+++ +++ +++			+++ +++		+++ +++		14		4					12		2		2		16		
	5											0		5											0		
	6							+++ +++		+++ +++		6		6							5		1		6		
	7											0		7											0		
	8										+++ +++	2		8								2			2		
	9											0		9											0		
B	To- tal	6	0	15	0	16	0	10	0	7	0	54	B	To- tal	6	0	15	0	16	0	10	0	7	0	54		





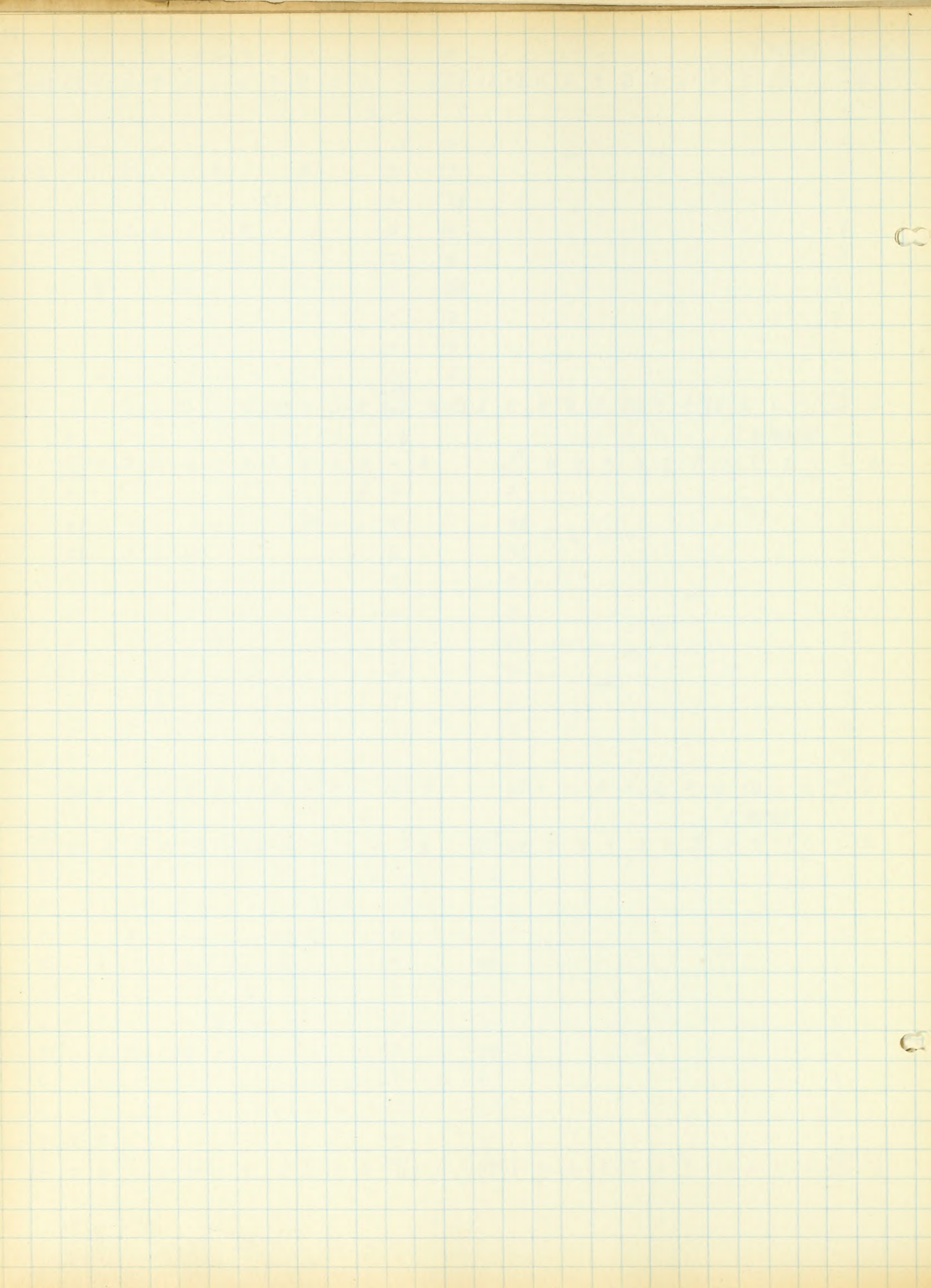


I														Page 7														114	
GROUP 7														D														D	
A	C	0	1	2	3	4	5	6	7	8	9	10	11	To- tal	A	C	0	1	2	3	4	5	6	7	8	9	10	11	To- tal
		"												2			0	2											2
				////		////			////					0			1												0
							////			////				17				4			7			5			1	17	
				////	////									17					17									17	
					////				///					8					4			3	1					8	
								////						0														0	
														12							10			2				12	
														0														0	
														0														0	
										////				4											4			4	
B	To- tal	2	0	4	17	4	7	10	3	6	6	0	1	60	B	To- tal	2	0	4	17	4	7	10	3	6	6	0	1	60

GROUP 8																									
A	C	0	1	2	3	4	5	6	7	8	9	To- tal	A	C	0	1	2	3	4	5	6	7	8	9	To- tal
0	////											4	0	4											4
1	////											10	1		10										10
2								///	///	///	///	12	2								3	3	3	3	12
3												0	3												0
4			///									5	4					5							5
5					///							5	5						5						5
6						///						5	6							5					5
7							///					6	7								6				6
8												1	8									1			1
9												0	9												0
B	To- tal	4	0	10	0	5	5	8	9	4	3	48	B	To- tal	4	0	10	0	5	5	8	9	4	3	48

GROUP 9																											
A	C	0	1	2	3	4	5	6	7	8	9	10	To- tal	A	C	0	1	2	3	4	5	6	7	8	9	10	To- tal
0	///												4	0	4												4
1	///												4	1		3	1										4
2	////												7	2			5	1					1				7
3	////												22	3				11		1	4	1		5		22	
4													2	4					2								2
5													1	5						1							1
6													15	6							12		2	1		15	
7													0	7													0
8													0	8													0
9													3	9											2	1	3
B	To- tal	4	3	6	12	2	2	16	1	3	8	1	58	B	To- tal	4	3	6	12	2	2	16	1	3	8	1	58



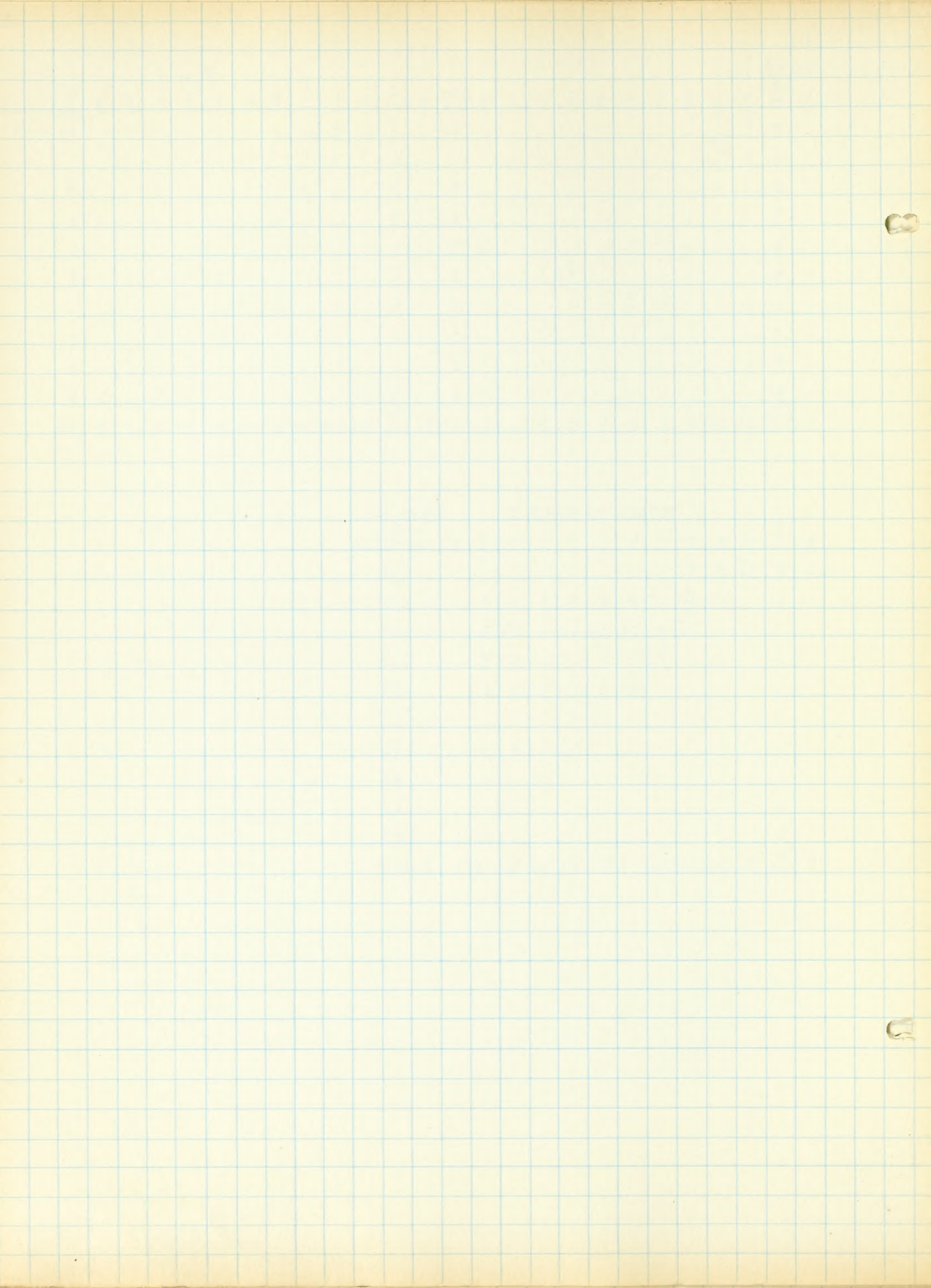




I													Page 7													D
GROUP 10																										D
A	C	0	1	2	3	4	5	6	7	8	9	To- tal	A	C	0	1	2	3	4	5	6	7	8	9	To- tal	
		0	1	2								17			0	10	5	2							17	
		1										9			1	9									9	
		2										2			2		2								2	
		3										1			3			1							1	
		4										0			4										0	
		5										1			5					1					1	
		6										0			6										0	
		7										2			7							2			2	
		8										1			8								1		1	
		9										1			9									1	1	
B	To- tal	10	14	4	1	0	1	0	2	1	1	34	B	To- tal	10	14	4	1	0	1	0	2	1	1	34	

TOTALS OF GROUP I													PAGE 6-7	
A	C	0	1	2	3	4	5	6	7	8	9	10	11	D Total
	0	36	5	2										43
	1		57	14	17	8	8	4	7	5	7			127
	2			86	3	11	14	10	4	13	3		1	145
	3				76	3	4	13	1	0	5			102
	4					51	0	5	4	5	1			66
	5						17							17
	6							53	4	5	5			67
	7								10					10
	8									13				13
	9										11	1		12
B	Total	36	62	102	96	73	43	85	30	41	32	1	1	602







## GROUP I

GROUP I													D														D
A	C	0	1	2	3	4	5	6	7	8	9	To- tal	A	C	0	1	2	3	4	5	6	7	8	9	To- tal		
	0											0		0											0		
	1		//// ////	////	"	"				/	"	22		1		11	4	2	2				1	2	22		
	2		//// //// ////	/	"	"	///	"	"	"	"	28		2			14	1	2	2	3	2	2	2	28		
	3				//// ////		/	///	/		/	13		3				7		1	3	1		1	13		
	4					//// ////	///	///	"	///		19		4				9	2	3	2	3			19		
	5						//// ////	/	"			8		5					5	1	2				8		
	6							///		"	/	6		6						3			2	1	6		
	7								///	"	"	6		7								3	2	1	6		
	8									"	"	4		8									2	2	4		
	9											0		9											0		
B	To- tal	0	11	18	10	13	10	13	10	12	9	106	B	To- tal	0	11	18	10	13	10	13	10	12	9	106		

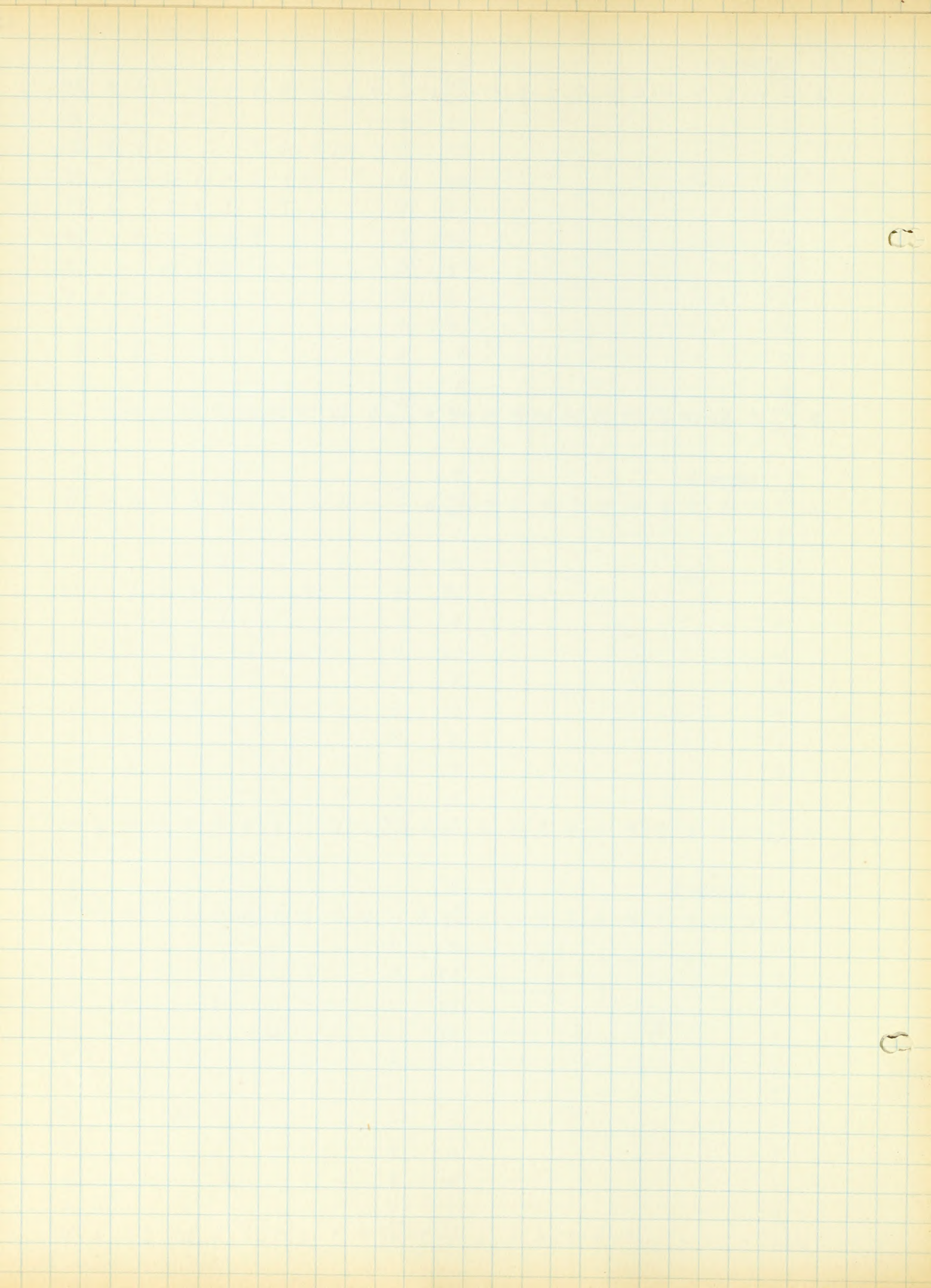
## GROUP 2

GROUP 2													D														D
A	C	0	1	2	3	4	5	6	7	8	9	To- tal	A	C	0	1	2	3	4	5	6	7	8	9	To- tal		
0												0	0												0		
1		/		/		/					////	8	1		1		1		1					5	8		
2			////	///	/		////	/	/			15	2			8		1		4	1	1		15			
3						/		/		/		3	3						1		1		1	3			
4					////	///	/		"	"		12	4				7			1		2	2	12			
5												0	5											0			
6							////		/			5	6							4		1		5			
7											////	0	7											0			
8												5	8									5		5			
9												0	9											0			
B To- tal		0	1	8	1	8	2	9	2	9	8	48	B To- tal		0	1	8	1	8	2	9	2	9	8	48		

## GROUP 3

A	C	0	1	2	3	4	5	6	7	8	9	D To- tal	A	C	0	1	2	3	4	5	6	7	8	9	D To- tal
0												0	0												0
1			/		////	"		///				10	1			1		4	2			3			10
2			/			"		///	///			10	2			1			2			3	4		10
3				////	////					/		12	3					11					1		12
4												0	4												0
5												0	5												0
6							////	////				10	6								10				10
7												0	7												0
8												0	8												0
9												2	9										2		2
B To- tal		0	0	2	11	4	4	10	6	4	3	44	B To- tal		0	0	2	11	4	4	10	6	4	3	44







II

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## GROUP 4

GROUP 4													D														D
A	C	0	1	2	3	4	5	6	7	8	9	To- tal	A	C	0	1	2	3	4	5	6	7	8	9	To- tal		
0												0	0												0		
1		"				"	"	///	"	"	///	18	1		2			2	2	3	2	2	5	18			
2						/	"			/		4	2						1	2		1		4			
3												0	3											0			
4						///						7	4					7						7			
5						"						2	5						2					2			
6							"					2	6								2			2			
7									///			3	7									3		3			
8										///		8	8										8	8			
9												0	9											0			
To- tal		0	2	0	0	9	5	7	5	11	5	44	To- tal		0	2	0	0	9	5	7	5	11	5	44		

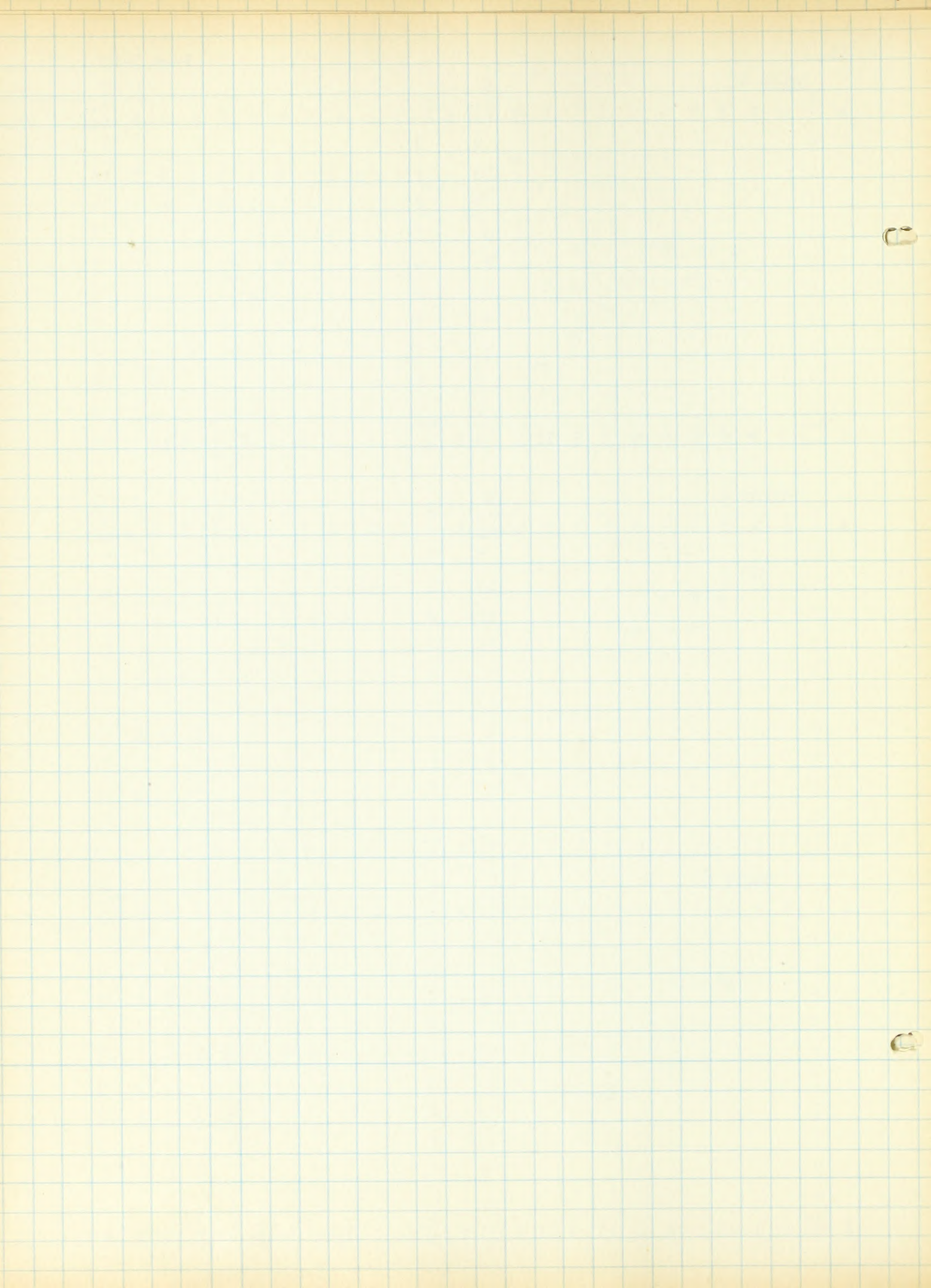
## GROUP 5

GROUP 5													D														D
A	C	0	1	2	3	4	5	6	7	8	9	To- tal	A	C	0	1	2	3	4	5	6	7	8	9	To- tal		
	0											0		0											0		
	1	+++ +++										12		1	12										12		
	2		+++	++	++			/		/		12		2			6	2	2		1		1		12		
	3			+++	++	////						11		3				5	2	4					11		
	4				++	/	/	++	/			7		4					2	1	1	2	1		7		
	5											0		5											0		
	6								+++	++	/	6		6								3	2	1	6		
	7											0		7											0		
	8										++	2		8									2		2		
	9											0		9											0		
B	To- tal	0	12	6	7	6	5	2	5	4	3	50	B	To- tal	0	12	6	7	6	5	2	5	4	3	50		

## GROUP 6

GROUP 6													D														D
A	C	0	1	2	3	4	5	6	7	8	9	To- tal	A	C	0	1	2	3	4	5	6	7	8	9	To- tal		
0												0	0												0		
1												0	1												0		
2			///	/	//			//		////	/	20	2				10	1	2		2		4	1	20		
3												0	3												0		
4					////	/		//	/	////		15	4					7	1	2	1	4			15		
5												0	5												0		
6								///	//	///	/	12	6							6	2	3	1	12	12		
7												0	7												0		
8										/		1	8										1		1		
9												0	9												0		
To- tal		0	0	10	1	9	1	10	3	12	2	48	To- tal		0	0	10	1	9	1	10	3	12	2	48	48	







## GROUP 7

GROUP 7														D															D
A	C	0	1	2	3	4	5	6	7	8	9	10	11	To- tal	A	C	0	1	2	3	4	5	6	7	8	9	10	11	To- tal
0														0	0														0
1														0	1														0
2			/		/	////	/		////	///			/	14	2			1		1	4	1		4	2		1	14	
3			///	///										14	3				14									14	
4						/			///	/	/			6	4						1		3	1	1			6	
5														0	5													0	
6							////	///			/			9	6						6	2		1				9	
7														0	7													0	
8														0	8													0	
9										///				3	9											3		3	
To- Btal		0	0	1	14	1	5	7	5	5	7	0	1	46	To- Btal	0	0	1	14	1	5	7	5	5	7	0	1	46	

## GROUP 8

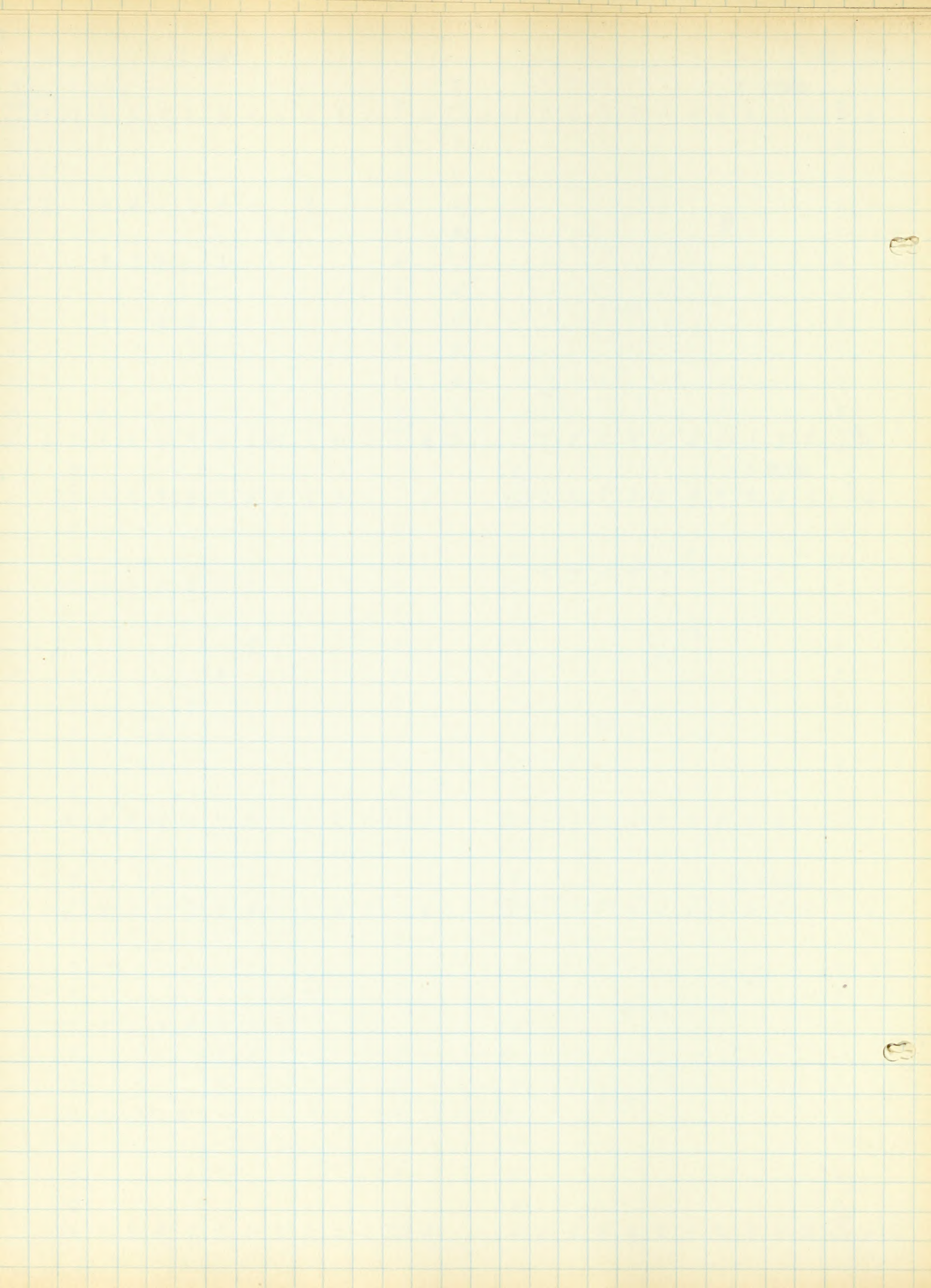
GROUP 8												
A	C	0	1	2	3	4	5	6	7	8	9	D To- tal
	0											0
	1					//	//	///	///	///	///	0
	2											25
	3											0
	4				///							7
	5					///						5
	6						///					5
	7							///	///			8
	8											0
	9											0
B	To- tal	0	0	0	0	9	7	11	13	5	5	50

A	C	0	1	2	3	4	5	6	7	8	9	D To- tal
	0											0
	1											0
	2							2	2	6	5	25
	3											0
	4							7				7
	5								5			5
	6									5		5
	7										8	8
	8											0
	9											0
B	To- tal	0	0	0	0	9	7	11	13	5	5	50

## GROUP 9

GROUP 9												D													D
A	C	0	1	2	3	4	5	6	7	8	9	To- tal	A	C	0	1	2	3	4	5	6	7	8	9	To- tal
	0											0		0											0
	1											0		1											0
	2			///	//							7		2			5	2							7
	3			///	//	///	///	///	/	//	///	23		3			6	2	5	4	1	2	3		23
	4					/	/					2		4				1	1						2
	5						///					2		5					2						2
	6						///	///			///	10		6							5	3	2		10
	7											0		7											0
	8											0		8											0
	9											0		9											0
B	To- tal	0	0	5	8	3	8	9	4	2	5	44	B	To- tal	0	0	5	8	3	8	9	4	2	5	44







II

## GROUP 10

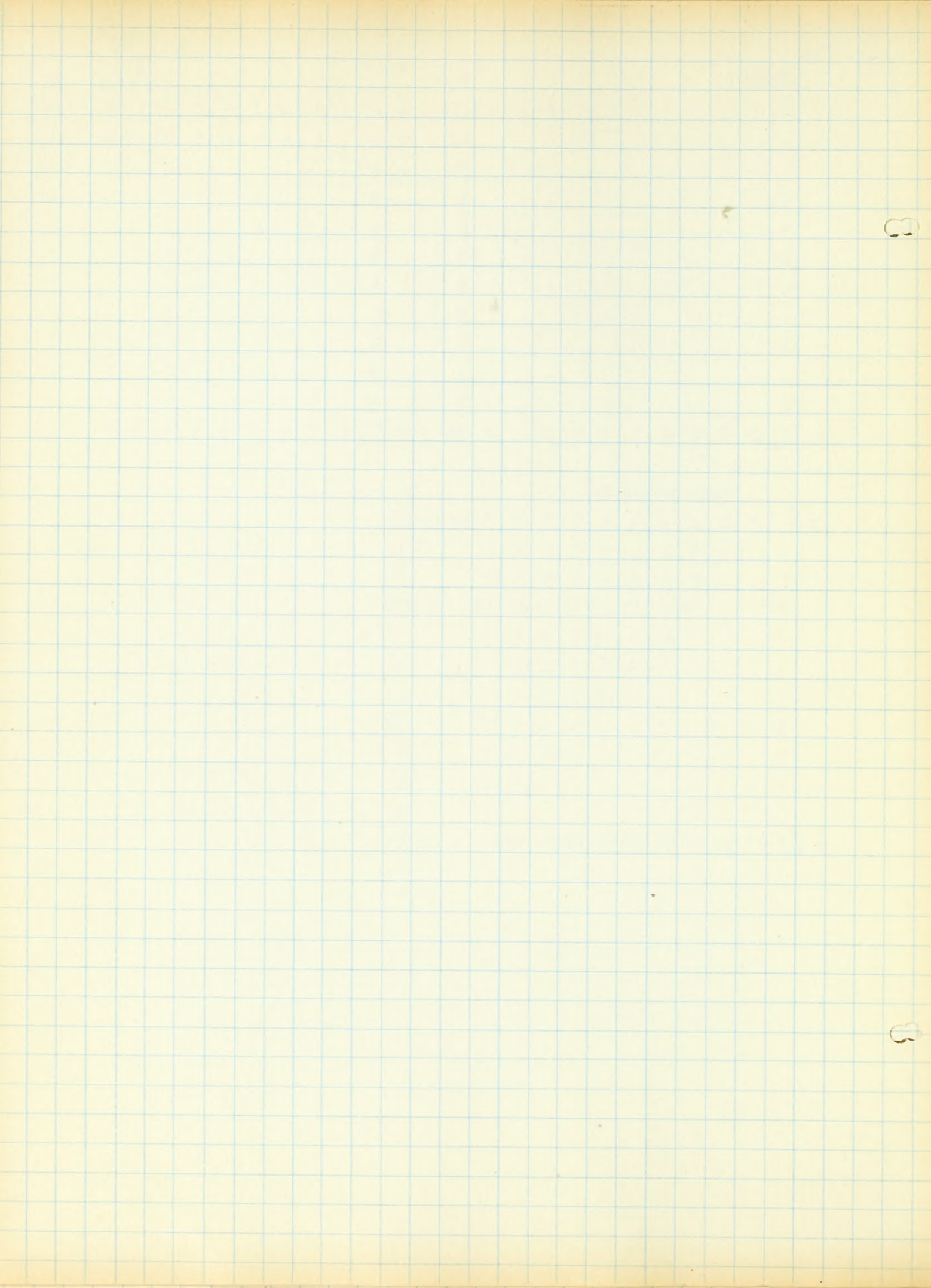
GROUP 10												D													D.
A	C	0	1	2	3	4	5	6	7	8	9	To- tal	A	C	0	1	2	3	4	5	6	7	8	9	To- tal
			'	'''	'	'	'''	''	''	''		18				1	4	1	1	5	2	2	2		18
	0		'''									5		1		5									5
	1											1		2			1								1
	2											1		3				1							1
	3											2		4					2						2
	4											2		5						2					2
	5											3		6							3				3
	6											1		7								1			1
	7											1		8									1		1
	8											2		9									2		2
	9											2											2		2
B	To- tal	0	6	5	2	3	7	5	3	3	2	36	B	To- tal	0	6	5	2	3	7	5	3	3	2	36

## TOTAL GROUPS II

D Page 9-10

A	C	0	1	2	3	4	5	6	7	8	9	10	11	Total
	0		1	4	1	1	5	2	2	2				18
	1		3	5	3	8	5	3	5	3	12			75
	2			4	6	10	11	19	11	22	10	1		136
	3				4	4	11	7	3	3	5			77
	4					4	2	6	7	8	11	3		77
	5						16	1	2					19
	6							4	4	10	8	6		68
	7								15	2	1			18
	8									19	2			21
	9										7			7
B	Total	0	32	55	54	65	54	83	56	70	46	0	1	516







TOTALS GROUP I

SUBTRACTIONS PAGE 6-7

A	C	0	1	2	3	4	5	6	7	8	9	10	11	D To- tal
	0	36	5	2										43
	1	57	14	17	8	8	4	7	5	7				127
	2		86	3	11	14	10	4	13	3		1		145
	3			76	3	4	13	1	0	5				102
	4				51	0	5	4	5	1				66
	5					17								17
	6						53	4	5	5				67
	7							10						10
	8								13					13
	9									11	1			12
B	To- tal	36	62	102	96	73	43	85	30	41	32	1	1	602

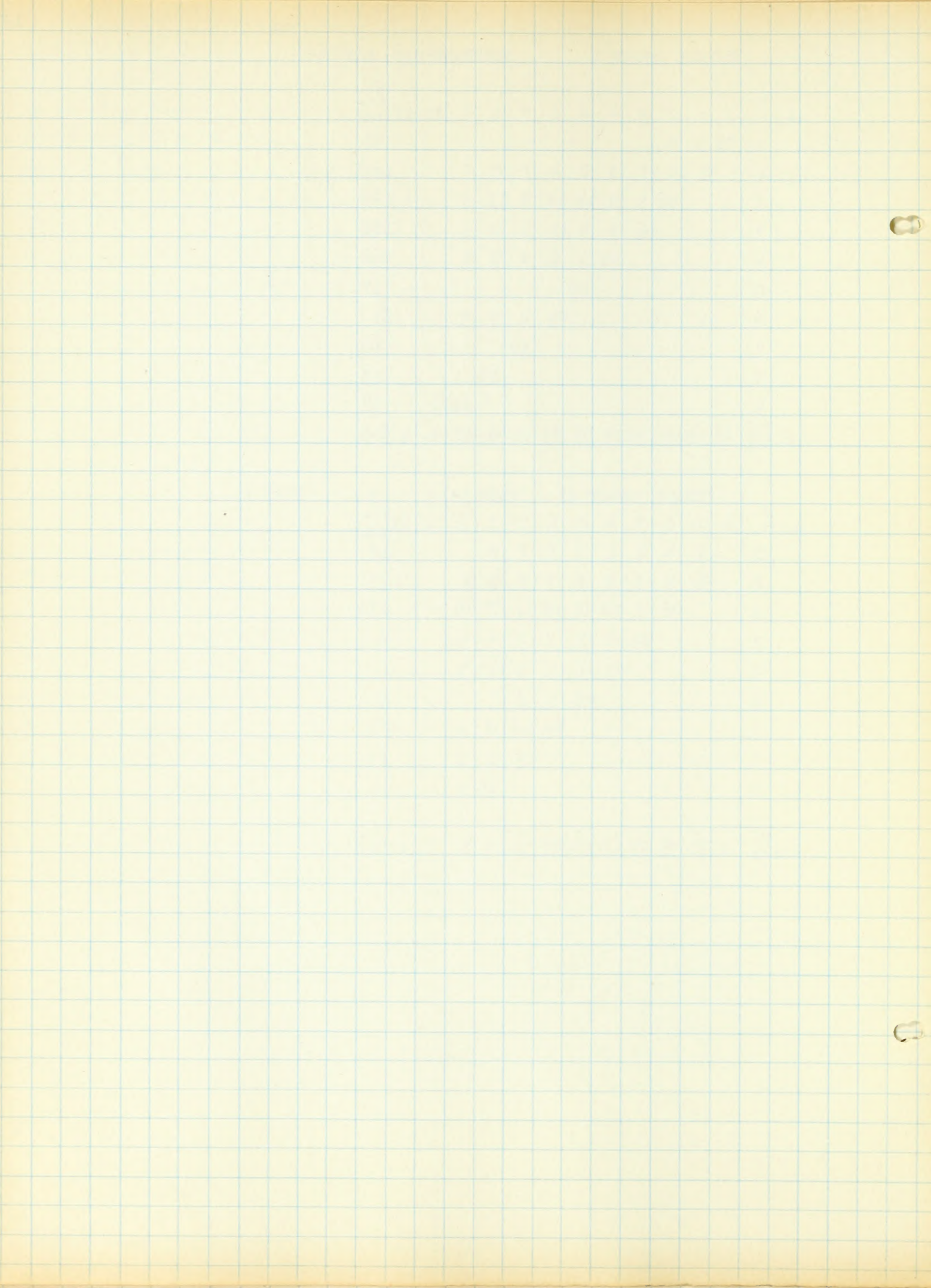
TOTALS GROUP II

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RULE I

A	C	0	1	2	3	4	5	6	7	8	9	10	11	D To- tal
	0		1	4	1	1	5	2	2	2				18
	1	31	5	3	8	5	3	5	3	12				75
	2		46	6	10	11	19	11	22	10		1		136
	3			44	4	11	7	3	3	5				77
	4				42	6	7	8	11	3				77
	5					16	1	2						19
	6						44	10	8	6				68
	7							15	2	1				18
	8								19	2				21
	9										7			7
B	To- tal	0	32	55	54	65	54	83	56	70	46	0	1	516







## III

## GROUP III

A	C										D	To- tal
		0	1	2	3	4	5	6	7	8	9	
0	0	1111 1111	111	1	11	1	1111	1	1111	1	1	25
1	1	1111 1111 1111 1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	58
2	2	1111 1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	43
3	3	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	12
4	4	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	29
5	5	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	11
6	6	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	23
7	7	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	4
8	8	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	6
9	9	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	0
B To- tal												11 50 23 15 24 12 20 16 18 22 211

## IV

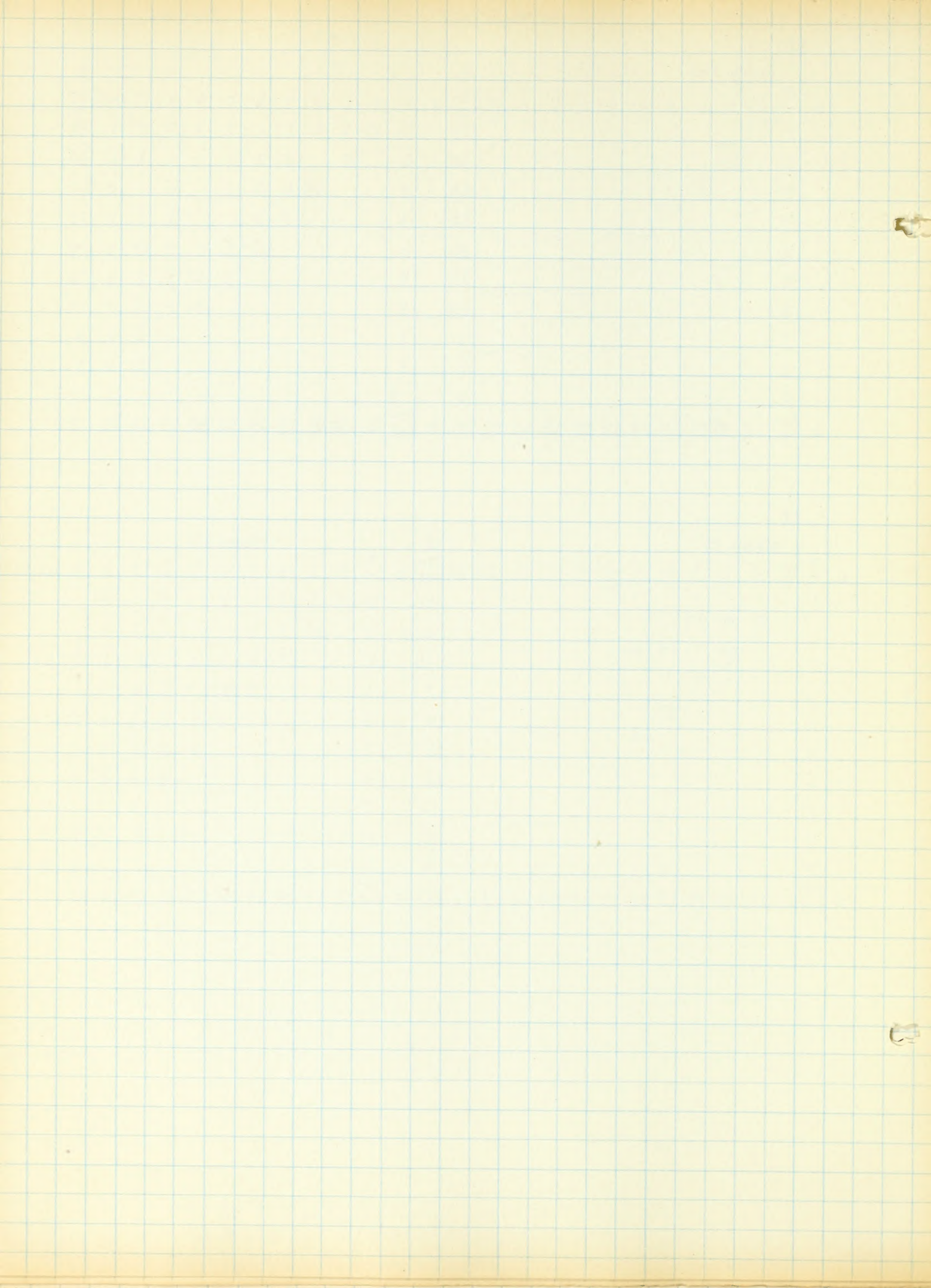
## GROUP IV

A	C												D	To- tal
		0	1	2	3	4	5	6	7	8	9	10		
0	0	1111 1111	111	111	111	111	111	111	111	111	111	111	11	11
1	1	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	22	22
2	2	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	36	36
3	3	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	12	12
4	4	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	17	17
5	5	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	17	17
6	6	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	16	16
7	7	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	2	2
8	8	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	6	6
9	9	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	4	4
B To- tal														2 13 22 15 16 12 11 17 19 12 3 1 143

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A	C												D	To- tal
		0	1	2	3	4	5	6	7	8	9	10		
0	0	1111 1111	111	111	111	111	111	111	111	111	111	111	11	11
1	1	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	22	22
2	2	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	36	36
3	3	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	12	12
4	4	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	17	17
5	5	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	17	17
6	6	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	16	16
7	7	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	2	2
8	8	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	6	6
9	9	1111 1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	4	4
B To- tal														2 13 22 15 16 12 11 17 19 12 3 1 143



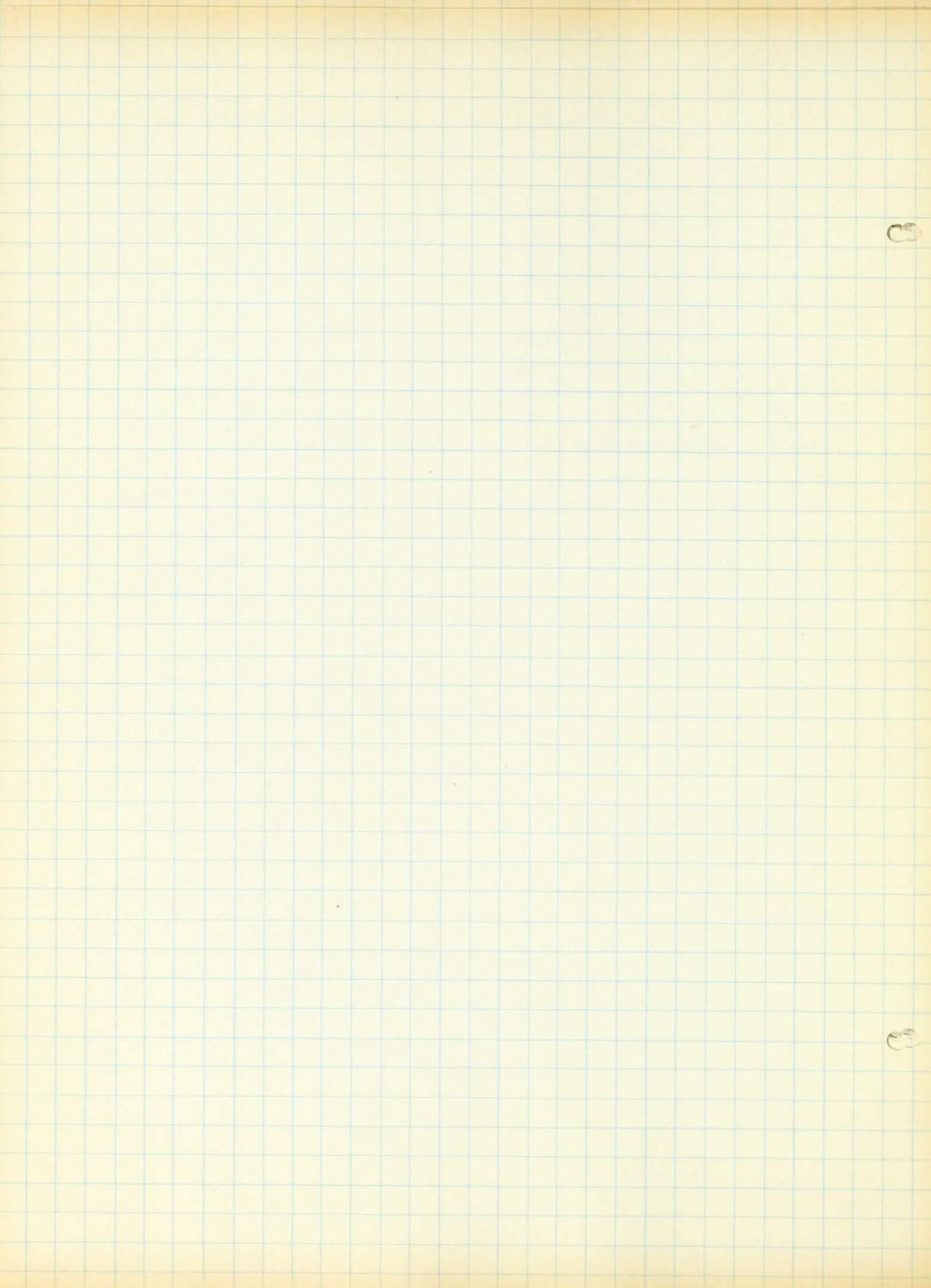




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		GROUP V																			D	
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
	-	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
	0																					4
	1		///	/		/			/													16
	2		///	///									/									14
	3			///	///						/	"	"									12
	4				///	///		/	/			///	/	/								16
	5						///	/				/	"									7
	6						///	///	"	/		///		"	"	/						17
	7																					1
	8								///	///	///	/	/		/		/	/				21
	9									///	/		/			/	///					9
B	Total	2	13	13	10	10	0	11	4	12	7	5	10	8	3	3	2	1	4	0	0	117
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
	-	2		2																		4
	1		13	1	1				1													16
	2			10	3								1									14
	3				7							1	2	2								12
	4					9		1	1				3	1	1							16
	5						3	1					1	2								7
	6						7			2	1		2		2	2	1					17
	7								1													1
	8									10	3	3	1	1		1		1	1			21
	9										3	1		1			1		3			9
B	Total	2	13	13	10	10	0	11	4	12	7	5	10	7	3	3	2	1	4	0	0	117







VI

## SUBTRACTIONS

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GROUP VI																					D	
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
	0	///	/	"	/	/																8
	1	////	////		///				/			/										16
	2		////	////	///	///							///	///								33
	3			////	///			/														13
	4				////					/		/	///	/	"							14
	5					/	/	/	"			////	///		///							15
	6					////	/	/	"			///	///	///	/	///						17
	7					///	///															6
	8								///	/		/	///	///	///							15
	9								////	///	///						/					16
B	Total	3	13	22	14	14	1	8	7	9	12	6	20	7	7	7	2	1	0	0	0	153

A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	D To- tal
	0	3	1	2	1	1																8
	1		12	2					1			1										16
	2			20	2	4						7										33
	3				9	3		1														13
	4					6				1		1	3	1	2							14
	5						1	1	1	2			5	2		3						15
	6							6	1	1	2		2		2	1	2					17
	7								4	2												6
	8									3	1		1	4	3	3						15
	9										9	4	2				1					16
B	To- tal	3	13	22	14	14	1	8	7	9	12	6	20	7	7	7	2	1	0	0	0	153







VII

## SUBTRACTIONS

PAGE 16

		GROUP VII																			D	
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
0	0	////	/	/	/		///		///	/	///											22
1	0		///	/	////	///	/	///	/	/												14
2	0		////	////	/	///	////	///	/	///												43
3	0		////	////	///	///	/	///	/													26
4	0			////	////	///	///	///	///	///		/	/									35
5	0																					1
6	0						///	///	///	///	///				/							27
7	0								///	/												4
8	0									///		/		/		/			/			8
9	0										/	/	/									3
B	Total	9	3	18	23	23	20	21	23	16	18	2	2	2	1	1	0	0	1			183
																					D	
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
0	9	1	1	1		4			3	1	2											22
1	2			1	4	2	1	2	1	1												14
2			17	7	1	5	7	2	1	3												43
3				14	2	4	1	4	1													26
4					16	4	3	3	3	4		1	1									35
5						1																1
6							9	6	4	7				1								27
7								3	1													4
8									4		1		1		1				1			8
9											1	1	1									3
B	Total	9	3	18	23	23	20	21	23	16	18	2	2	2	1	1	0	0	1	0	0	183







VIII

## SUBTRACTIONS

PAGE 17

GROUP VIII																					D	
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	To- tal
	0	///	///	/	"	/			/	/												17
	1	///	///						/													15
	2		///	///	"	/	"				/	///	/									35
	3				///	"	/	/		/		"										12
	4				"	"	/	/	/	"		///	"	/	/							18
	5					///	///	///	///		///											15
	6						///	/	///	/	///		/	/								19
	7							"	/	///	/	"										9
	8									///	///	/		/					/			14
	9									"	///	/	/				/	/				11
B	To- tal	7	18	18	15	6	8	12	9	10	10	36	7	3	3	0	1	1	1	0	0	165
GROUP VIII																					D	
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	To- tal
	0	7	4	1	2	1			1	1												17
	1		14						1													15
	2			17	6	2	1	2			1	5	1									35
	3				7		1	1		1		2										12
	4					3	2	1	1	2		5	2	1	1							18
	5						4	3	3	2		3										15
	6							5	1	3	1	7		1	1							19
	7								2	1	3	1	2									9
	8										3	8	1		1				1			14
	9										2	5	1	1			1	1				11
B	To- tal	7	18	18	15	6	8	12	9	10	10	36	7	3	3	0	1	1	1	0	0	165







IX

## SUBTRACTIONS

Page 19

GROUP IX																					D	
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
0		///	///	/	///			/		/												10
1			+++ ///	/			/		/		/											17
2				+++ ///	/	/	/	///	///	///	/											23
3					+++ ///								/									9
4						+++ ///	///	///				///		/								18
5							+++ ///	///	///	/	///	///										17
6								+++ ///	+++ ///	///			///		/	/	/					17
7									+++ ///		/	///	/									9
8										///	///	/	/	///	/	/		/				15
9											///	///		/				/				6
B	Total	3	15	13	11	11	12	13	14	10	11	12	5	4	2	2	1	0	2	0	0	141

GROUP IX																					D	
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
0		3	2	1	2			1			1											10
1			13	1			1			1		1										17
2				11	1	1	3	2	2	1												23
3					8								1									9
4						10	3	2				2		1								18
5							5	3	2	1	2	4										17
6								5	5	2			2		1	1	1					17
7									5		1	2	1									9
8										4	4	1	1	2	1	1			1			15
9											2	2		1					1			6
B	Total	3	15	13	11	11	12	13	14	10	11	12	5	4	2	2	1	0	2	0	0	141







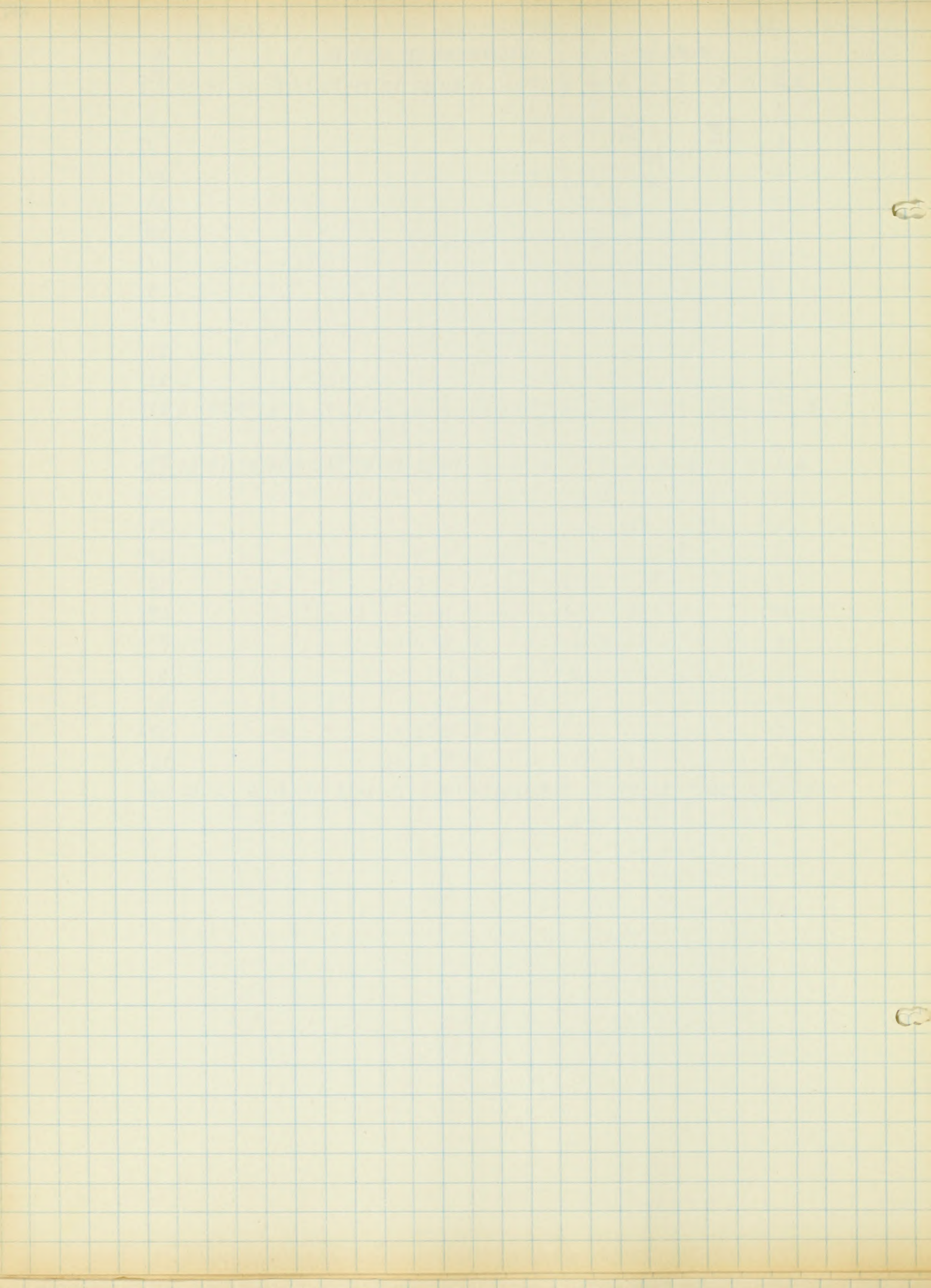
IX

SUBTRACTIONS

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GROUP IX										EXCEPTIONS TO RULE I										D		
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	To- tal
	0		/	/			/															3
	1		+++ +++ +++			+++ +++						///										27
	2			+++ +++	+++ +++							///	///									18
	3				///		///	/		/			/	/								10
	4					+++		/		///		/	///		/							12
	5						///	/			/	///										7
	6							///			///	/										5
	7								///			///				/						6
	8									+++ ///	+++ ///	///	/				/					17
	9										+++ ///	///		/								11
B	To- tal	0	16	7	11	15	6	5	3	11	14	17	6	2	1	1	0	1	0	0	0	116
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	To- tal
	0		1	1		1																3
	1		15			10						2										27
	2			6	7							3	2									18
	3				4		2	1		1			1	1								10
	4					5		1		2		1	2		1							12
	5						3	1			1	2										7
	6							2			2	1										5
	7								3			2				1						6
	8									8	5	2	1				1					17
	9										6	4		1								11
B	To- tal	0	16	7	11	15	6	5	3	11	14	17	6	2	1	1	0	1	0	0	0	116







## SUBTRACTIONS

PAGE 12-19

TOTALS GROUPS III, IV, V, VI, VII, VIII, IX

RULE I

A	C																				D			
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total		
0	-	37	11	9	7	5	5	8	4	6	4		1										97	
1		11	3	4	9	6	4	5	8	4	2	2		1									158	
2			11	5	25	17	16	11	13	6	10	5	9										227	
3				6	2	7	5	4	6	3	1	3	3	2									96	
4					6	9	16	8	11	9	8	8	9	5	4								147	
5						19	15	10	11	8	7	6	4			3							83	
6							4	5	19	24	19	7	6	1	7	4	4						136	
7								19	5		5	3	3										35	
8									26	17	14	4	8	5	6		1	4					85	
9										18	15	5	3	0	0	2	2	4					49	
To-Btal		37	12	4	12	8	10	3	10	4	6	5	9	6	9	0	9	4	9	2	6	4	4	1113

TOTALS GROUP IX EXCEPTIONS TO RULE I

																					D	
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	To- tal
	0		1	1			1															3
	1		15			10						2										27
	2			6	7							3	2									18
	3				4		2	1		1			1	1								10
	4					5		1		2		1	2		1							12
	5						3	1			1	2										7
	6							2			2	1										5
	7								3			2				1						6
	8									8	5	2	1					1				17
	9										6	4		1								11
B	To- tal	0	16	7	11	15	6	5	3	11	14	17	6	2	1	1	0	1	0	0	0	116







X

## SUBTRACTIONS RULE II

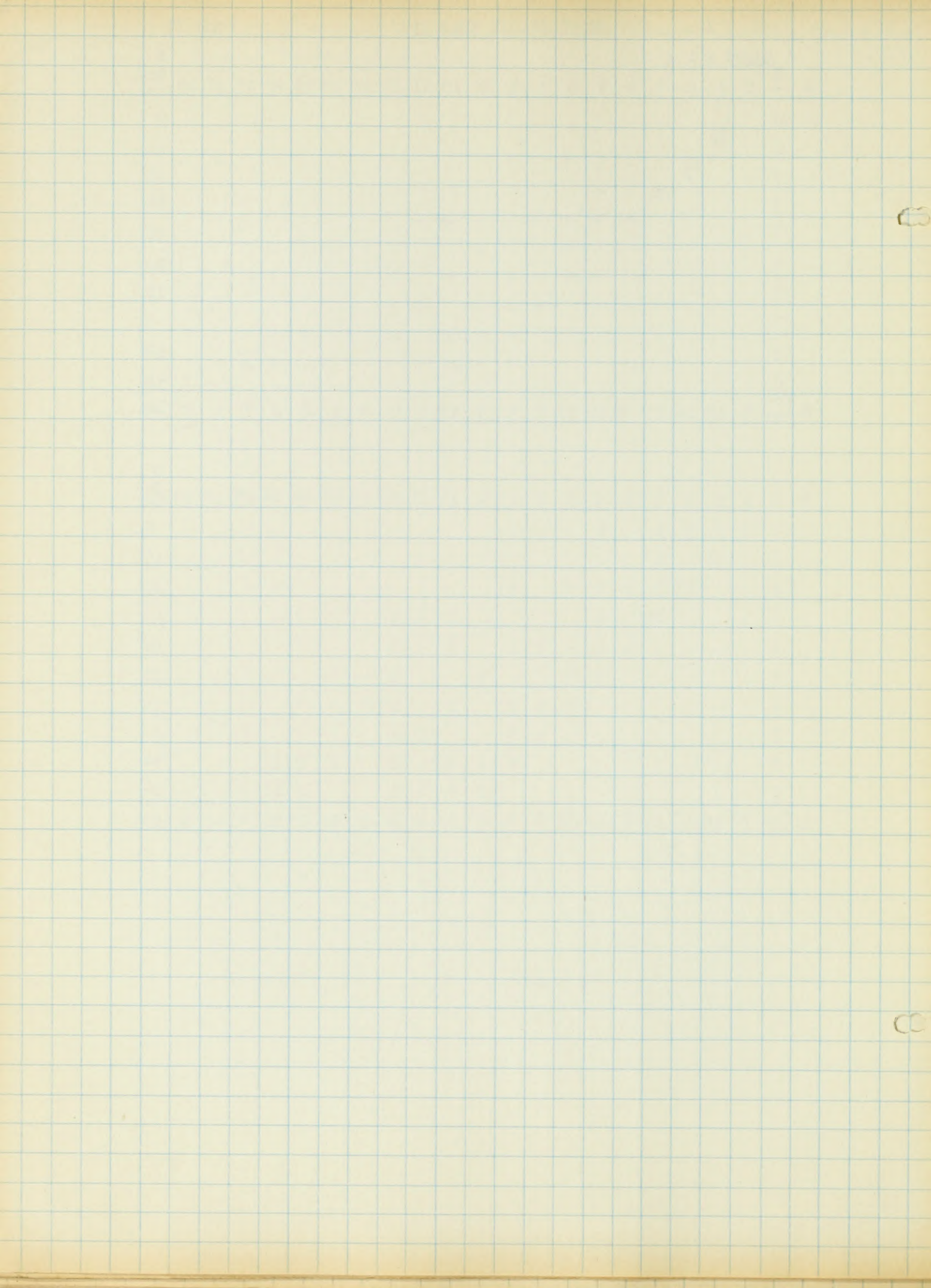
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## GROUP X - A

A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	D To- tal
0		'''	'	'''	,		,															9
1		'''	'''																			15
2			'''	'''	'	''	'	''														20
3				'''			'					''	''	'								16
4					'''	'''	'''	'''	'''	'		'''	'''	'								26
5						'''	'''				'			'								10
6							'''	'	''			'		''								10
7							'''	'''					'	'								9
8									''	''	'''		''			/	/	'				14
9										''	'''	''	'			/	/	'''				14
B To- tal		3	15	16	13	6	10	15	8	9	5	18	8	9	0	1	2	2	3	0	0	143

A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	D To- tal
0		3	1	3	1		1															9
1			14		1																	15
2				13	1	2	1	2		1												20
3					10		1					2	2	1								16
4						4	4	4	3	1		6	3	1								26
5							3	5			1			1								10
6								4	1	2		1		2								10
7									4	3			1	1								9
8										2	2	5		2		1	1	1				14
9											2	4	2	1			1	1	3			14
B To- tal		3	15	16	13	6	10	15	8	9	5	18	8	9	0	1	2	2	3	0	0	143







X

## SUBTRACTIONS RULE II

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## GROUP X- B

A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	D Total
0	'																					1
1	'''																					3
2			'''		''	'																6
3				'		'																2
4					'		''				'				'							5
5					'''	'					'											5
6									'													1
7								''			'''		''									7
8									''		'	'					'					5
9										'	'								'			3

B	Total	1	3	3	1	2	6	1	5	2	1	7	1	2	1	0	1	0	1	0	0	38
---	-------	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	----

A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	D Total
0	1																					1
1		3																				3
2			3		2	1																6
3				1		1																2
4						1		2				1			1							5
5						3	1					1										5
6									1													1
7									2			3		2								7
8										2		1	1				1					5
9											1	1							1			3

B	Total	1	3	3	1	2	6	1	5	2	1	7	1	2	1	0	1	0	1	0	0	38
---	-------	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	----







X		SUBTRACTIONS																		RULE II		Page 24	
A	Group X - C																						
	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	D	Total
	0	"		/																			3
	1		///		///																		15
	2			///	/		/	/		/	/												9
	3				///	///	/		/			/	/										12
	4					///	/	/	///		///	/	/	/									13
	5						///	///	///			/											8
	6							/		/	/		/		/								5
	7								///	/		///			///			/		/			9
	8									///		/	/	///			/		/				11
	9											/	/	/		///	/						6
B	Total	2	12	5	7	8	5	6	8	8	5	7	5	4	3	2	2	1	1	0	0		91

A	Group X - C																						
	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	D	Total
	0	2		1																			3
	1		12		3																		15
	2			4	1		1	1		1	1												9
	3				3	5	1		1			1	1										12
	4					3	1	1	2		3	1	1	1									13
	5						2	3	2			1											8
	6							1		1	1		1		1								5
	7								3	1		2			2			1					9
	8									5		1	1	2			1		1				11
	9											1	1	1		2	1						6
B	Total	2	12	5	7	8	5	6	8	8	5	7	5	4	3	2	2	1	1	0	0		91







X

## SUBTRACTIONS RULE II

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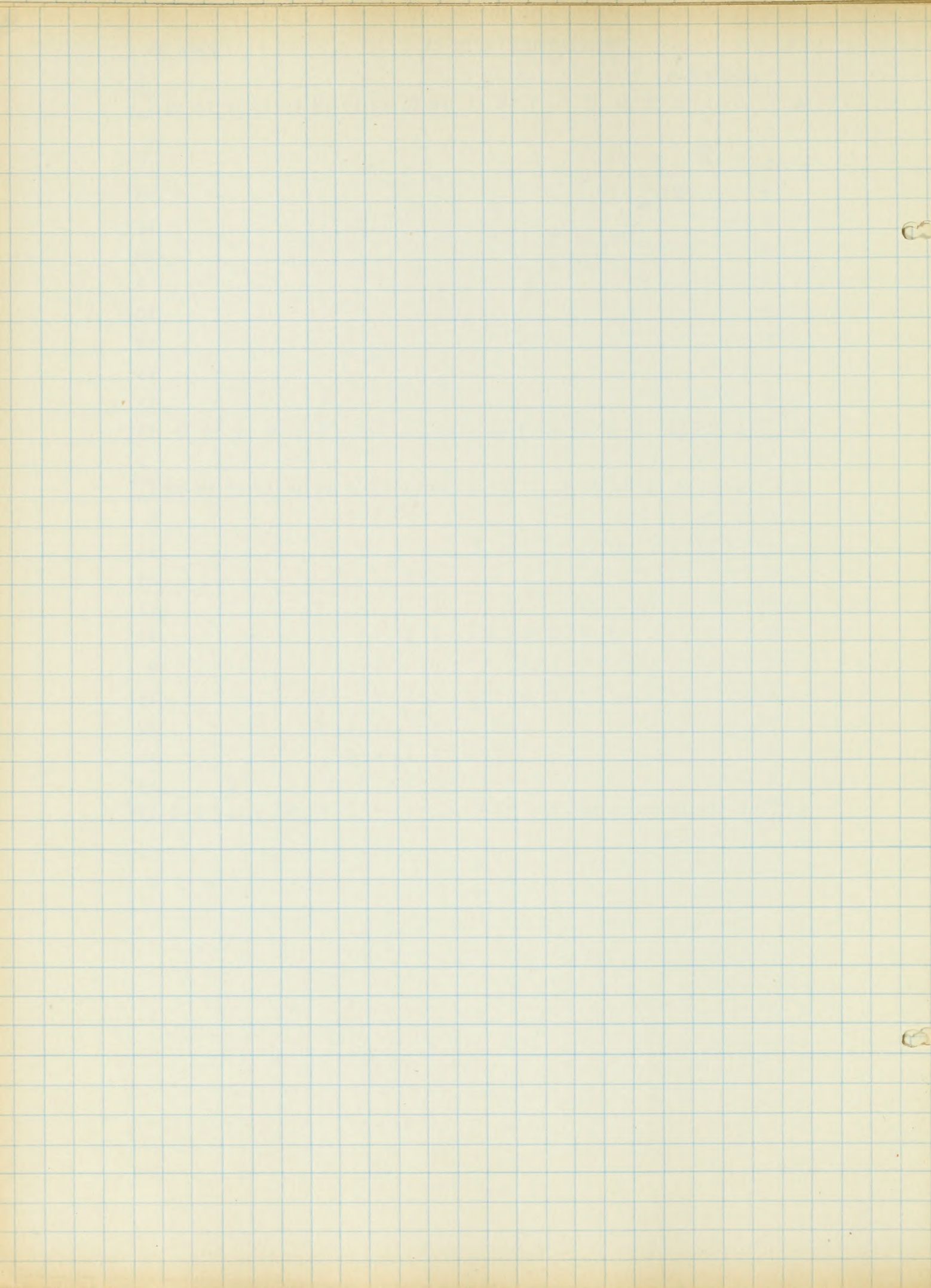
GROUP X-D																					D	
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
0		/	"			/																4
1			///	"		"	/				/											19
2			///	///	/		"					///	/									23
3				///	///		-11			///		/										11
4					///	///	///	///	/	"		/	/									16
5						///	/	"				/		/	/							9
6							/	///	/	///	///	/	/	/		/						15
7								"	///	///	/			/	/	/						12
8									"	"	"	/	/	"	"							11
9											///	///		///	/				/			13

B Total 1 15 18 6 8 12 4 9 11 9 17 7 5 7 3 0 0 1 0 0 133

A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
0		1	2		1																	4
1			13	2	2	1					1											19
2				16	1	2						3	1									23
3					5	2				3		1										11
4						5	4	2	1	2		1	1									16
5							3	1	2			1		1	1							9
6								1	4	1	3	3	1	1		1						15
7									2	3	3	1		1	1	1						12
8										2	2	2	1	2	2							11
9												5	3		3	1			1			13

B Total 1 15 18 6 8 12 4 9 11 9 17 7 5 7 3 0 0 1 0 0 133







X

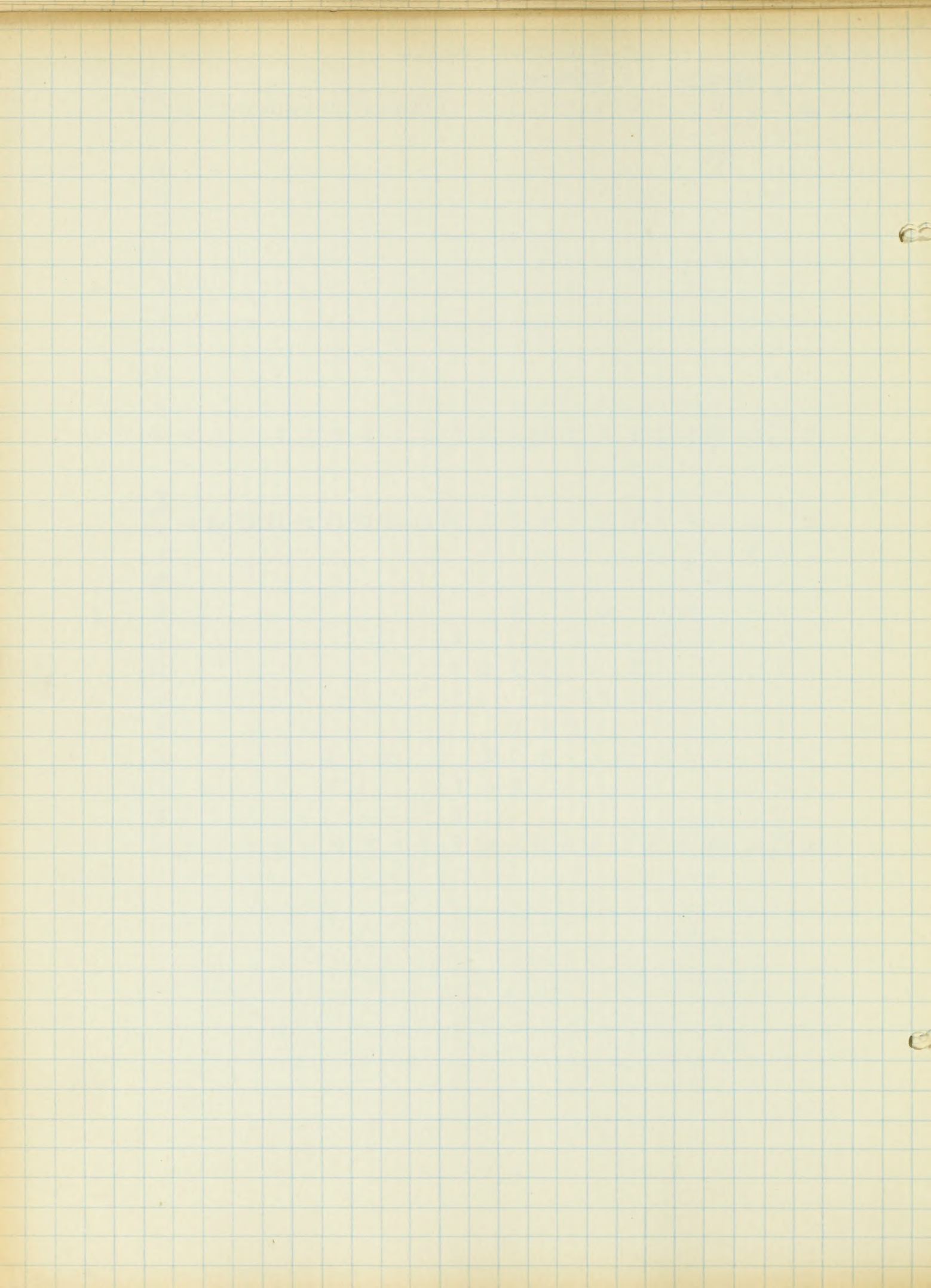
## SUBTRACTIONS RULE II

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GROUP X				EXCEPTIONS																	D	
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	To- tal
	0	/																				1
	1	+++ +++								/												11
	2		+++				//			//												9
	3			///			/					/										5
	4				/				///	///	/	///										11
	5					//		/				/										4
	6						//	/	/													4
	7							+++ ///		/		/			/		/					11
	8								//	/	/				/	/						6
	9									/	/											2
B	To- tal	1	10	5	3	1	4	3	13	9	4	7	0	1	1	2	0	0	0	0	0	64

A	C	GROUP X																			D To- tal	
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
	0	1																				1
	1		10							1												11
	2			5			2			2												9
	3				3			1				1										5
	4					1			3	3	1	3										11
	5						2		1			1										4
	6							2	1	1												4
	7								8		1			1		1						11
	8									2	1	1			1	1						6
	9										1	1										2
B	To- tal	1	10	5	3	1	4	3	13	9	4	7	0	1	1	2	0	0	0	0	0	64







## SUBTRACTIONS RULE II

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GROUP 10										EXCEPTIONS 2										D		
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	To- tal
	0																					0
	1		/							/												2
	2			///																		4
	3				/																	1
	4																					0
	5						//															2
	6							/		/	//	/			/		/					7
	7							/	//	/	/			/			/					7
	8									/	///			/								5
	9										//											2
B	To- tal	0	1	4	1	0	2	2	2	4	8	1	0	2	1	0	2	0	0	0	0	30

		GROUP 10																			EXCEPTIONS 2																			D
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total																		
	0																					0																		
	1		1							1												2																		
	2			4																		4																		
	3				1																	1																		
	4																					0																		
	5					2																2																		
	6						1			1	2	1			1		1					7																		
	7						1	2	1	1				1			1					7																		
	8								1	3				1								5																		
	9										2											2																		
B	Total	0	1	4	1	0	2	2	2	4	8	1	0	2	1	0	2	0	0	0	0	30																		







X		SUBTRACTIONS RULE II																			Page 29	
GROUP X		Exceptions 3																			D	
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	To- tal
	0	/// ///		/	"	/	///	/														16
	1	///	///	///	"	/	/					/										62
	2			///	///	"	///	/	"	/		/										21
	3				///	///	///	/		/	/	///		/								16
	4					///	///	/		/	/	///		/								22
	5						///	///	/	"	"	"		/								23
	6							///	///	///	/	"	"	/			/					29
	7								///	///	/		/					/				13
	8									///	///	"		///	/	/	"	/	/			20
	9										///	///	/			"						19
B	To- tal	12	46	15	13	20	23	20	16	16	18	20	5	5	3	3	3	2	1	0	0	241

		C																			D	
A		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	To- tal
	0	8		1	2	1	3	1														16
	1	4	46	7	2	1	1					1										62
	2			7	3	2	2	1	2	1	1	1	1									21
	3				6	7					1	2										16
	4					9	5	1		1	1	3		1	1							22
	5						12	6	2			2			1							23
	6							11	6	5	1	2	2	1			1					29
	7								6	4	1		1					1				13
	8									5	4	2		3	1	1	2	1	1			20
	9										9	7	1			2						19
B	To- tal	12	46	15	13	20	23	20	16	16	18	20	5	5	3	3	3	2	1	0	0	241







## X SUBTRACTIONS

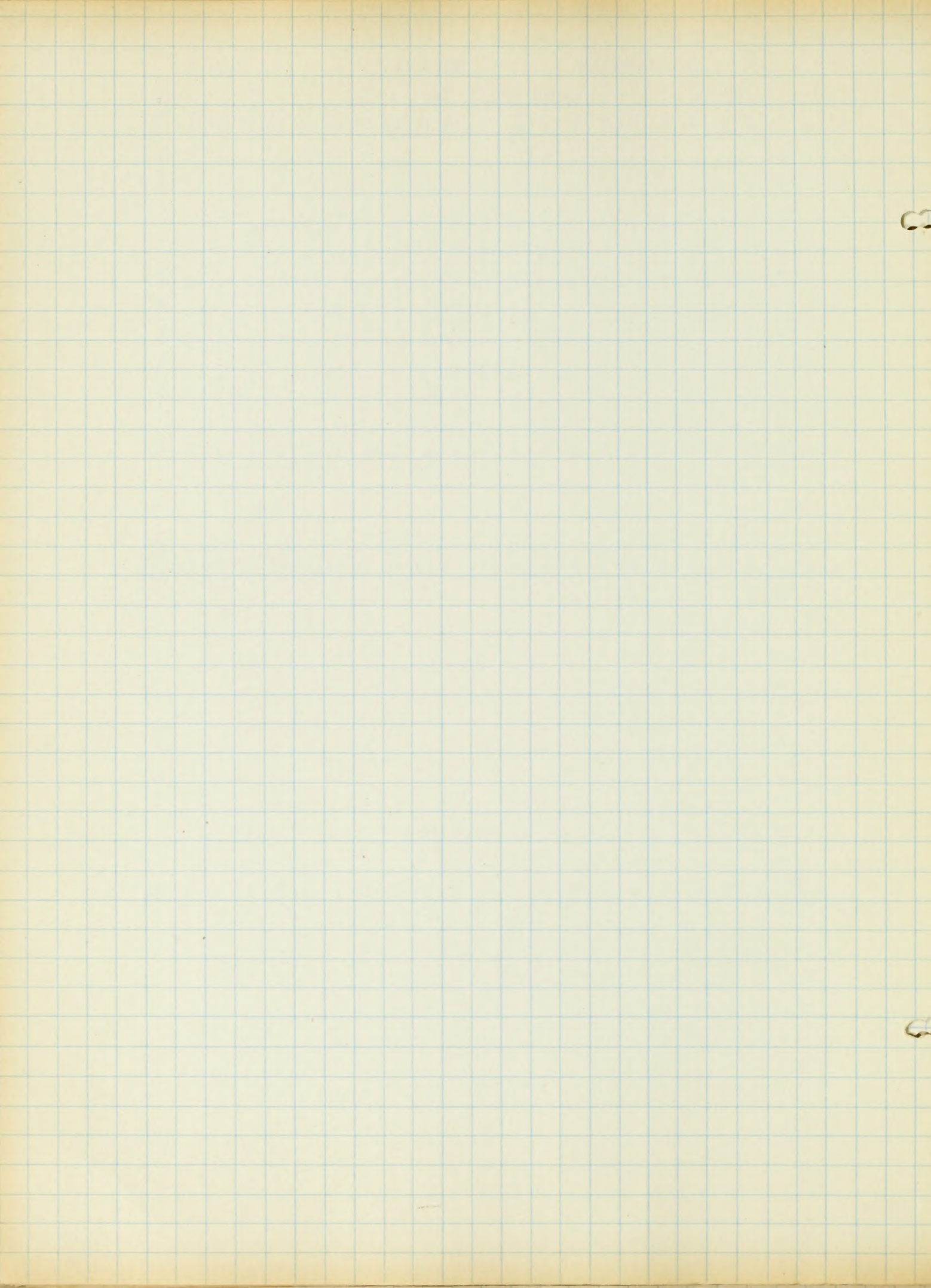
## RULE II

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GROUP X					EXCEPTIONS					4A															D
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total			
	0	/				/		/		/												4			
	1		///																			3			
	2			///	/																	6			
	3				///									/								3			
	4					/			///													3			
	5						/	/	/		/				/							5			
	6															/						1			
	7								/			/		/								3			
	8									///	///	/	/						/			8			
	9																					0			
B	Total	1	3	5	2	3	1	2	4	3	4	2	1	2	1	1	0	0	1	0	0	36			

A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	D
		0	1			1		1		1												To- tal
	0	1				1		1		1												4
	1		3																			3
	2			5		1																6
	3				2									1								3
	4					1			2													3
	5						1	1	1		1				1							5
	6															1						1
	7								1			1		1								3
	8									2	3	1	1						1			8
	9																					0
B	To- tal	1	3	5	2	3	1	2	4	3	4	2	1	2	1	1	0	0	1	0	0	36







X SUBTRACTIONS RULE II Page 30

GROUP X

EXCEPTIONS 4 B

A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	D To- tal
0		/		/		"																4
1			///				/	/														8
2				/	/	/	"		/		/		/									8
3					///						/		/									6
4						"	/	/														3
5							/				/	/				/	//	"				6
6								/						//	/							3
7								/	/	"							/	/				6
8									"	/	"			///	/	/						10
9										/				/	/				/			4
B To- tal		1	6	2	5	5	4	2	3	3	7	3	2	6	3	4	1	0	1	0	0	58

A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	D To- tal
0		1		1		2																4
1			6				1	1														8
2				1	1	1	2		1		1		1									8
3					4						1		1									6
4						2		1														3
5							1				1	1			/	1						6
6									1					2								3
7									1	1	2					/	1					6
8										2	1	2		3	1	1						10
9											1			1	1				1			4
B To- tal		1	6	2	5	5	4	2	3	3	7	3	2	6	3	4	1	0	1	0	0	58







X		SUBTRACTIONS										RULE II											
		TOTALS					GROUP X					A, B, C, D											
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	D	To- tal
	0	7	3	4	1	1	1															17	
	1		4	2	4	2	1				1											52	
	2			3	6	3	4	5	3		2	1	3	1								58	
	3				1	9	5	5		1	3		4	3	1							41	
	4					1	2	10	7	8	3	3	9	5	2	1						60	
	5						1	1	0	4		1	3		2	1						32	
	6							6	5	4	4	4	2	3	1	1			1			31	
	7								1	1	7	3	6	1	4	3	1		1			37	
	8									1	1	4	9	3	6	2	1	3	1	1		41	
	9										3	1	1	6	2	3	3	2	1	5		36	
B	To- tal	7	4	5	4	2	7	2	4	3	3	2	6	2	9	3	0	7	0	0		405	

		TOTALS				GROUP X				EXCEPTIONS 1, 2, 3, 4										D		
A	C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
	0	11		2	2	4	3	2	1													25
	1		70	7	2	1	2	1		2		1										86
	2			22	4	4	6	1	3	3	2	1	2									48
	3				16	7		1			2	3	1	1								31
	4					13	5	2	5	4	2	6		1	1							39
	5						18	7	4		2	4			3	2						40
	6							14	8	7	3	3	2	3	1	1	2					44
	7								19	6	5	1	1	3	1	2	1	1				40
	8									12	12	6	1	7	3	3	2	1	2			49
	9										13	8	1	1	1	2			1			27
B	Total	11	70	31	24	29	34	28	40	34	41	33	8	16	10	10	5	2	3	0	0	429







## SUBTRACTIONS

C																				D	
Totals for Rule I																					
A	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
0	73	19	16	8	6	11	10	6	8	4											161
1		216	24	29	32	17	12	20	12	21	4										387
2			253	41	38	41	40	28	41	23	8	13									526
3				186	14	22	25	10	7	11	3	4	3								285
4					167	22	21	23	27	12	9	11	5	5							302
5						55	17	12	11	9	9	6	4		3						126
6							144	33	37	32	8	6	1	7	4	4					276
7								47	7	6	5	3			1						69
8									66	24	16	5	8	5	6		2	4			136
9										42	20	5	4			2	2	4			79
B Total	73	235	293	264	257	168	269	179	216	184	82	53	25	17	14	6	4	8	0	0	2347

C																				D	
TOTALS FOR RULE II																					
A	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
0	18	3	6	3	5	4	2	1													42
1		112	9	6	3	3	1		2	1	1										138
2			58	7	8	11	4	3	5	3	4	3									106
3				35	12	5	1	1	3	2	7	4	2								72
4					25	15	9	13	7	5	15	5	3	2							99
5						29	17	8		3	7		2	4	2						72
6							20	14	11	7	7	4	6	2	2	2					75
7								30	13	8	7	2	7	4	3	1	2				77
8									23	16	15	4	13	5	4	5	2	3			90
9										16	19	7	3	4	5	2	1	6			63
B Total	18	115	73	51	53	67	54	70	64	61	82	29	36	21	16	10	5	9	0	0	834

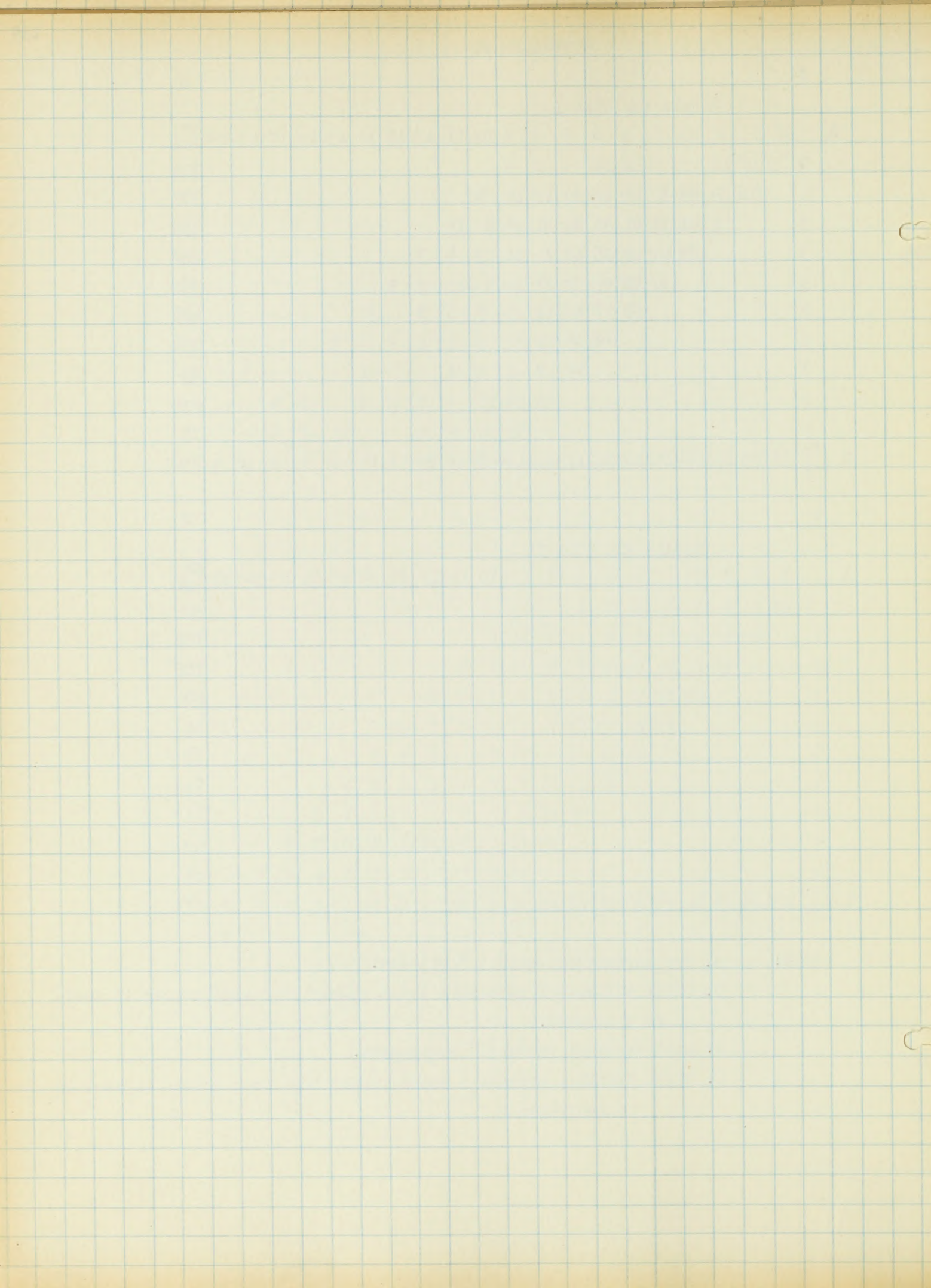
NOTE: A. Top horizontal numbers = minuend.

B. Lower horizontal numbers = total number that each number is used as a minuend.

C. Left vertical numbers = subtrahend.

D. Right vertical numbers = total number that each number is used as a subtrahend.







SUBTRACTIONS  
TOTALS FOR RULE I AND II

A	C																			D	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
0	91	21	22	11	11	15	12	7	8	4											203
1		328	33	35	35	20	13	20	14	22	5										525
2			311	48	46	52	44	31	46	26	12	16									632
3				221	26	27	26	11	10	13	10	8	5								357
4					192	37	30	36	34	17	24	16	8	7							401
5						84	34	20	11	12	16	6	6	7	2						198
6							164	46	49	39	15	10	7	9	6	6					351
7								77	20	14	12	5	7	4	4	1	2				146
8									89	40	31	9	21	10	10	5	4	7			226
9										58	39	12	7	4	5	4	3	10			142
B Total	91	349	366	315	310	235	323	248	281	245	164	82	61	41	27	16	9	17	0	0	3181

## NOTE:

- A. Top horizontal numbers = minuend
- B. Lower horizontal numbers = total number that each number is used as a minuend.
- C. Left vertical numbers = subtrahend
- D. Right vertical numbers - total number that each number is used as a subtrahend,







## MULTIPLICATIONS







## M U L T I P L I C A T I O N

## K E Y     T O     T H E     W O R K

- A. Top horizontal number = multiplicand.
- B. Lower horizontal number = total number of times  
each number is used as a multiplicand.
- C. Left vertical number = multiplier.
- D. Right vertical number = total number of times  
each number is used as a multiplier







## MULTIPLICATIONS

GROUP 1.

A	x	C	D
0	1	2	Total
0	1	2	0
1	1	2	108
2	1	2	0
3	1	2	0
4	1	2	0
5	1	2	0
6	1	2	0
7	1	2	0
8	1	2	0
9	1	2	0

B	Total	0	26	32	32	10	4	4	0	0	0	108
---	-------	---	----	----	----	----	---	---	---	---	---	-----

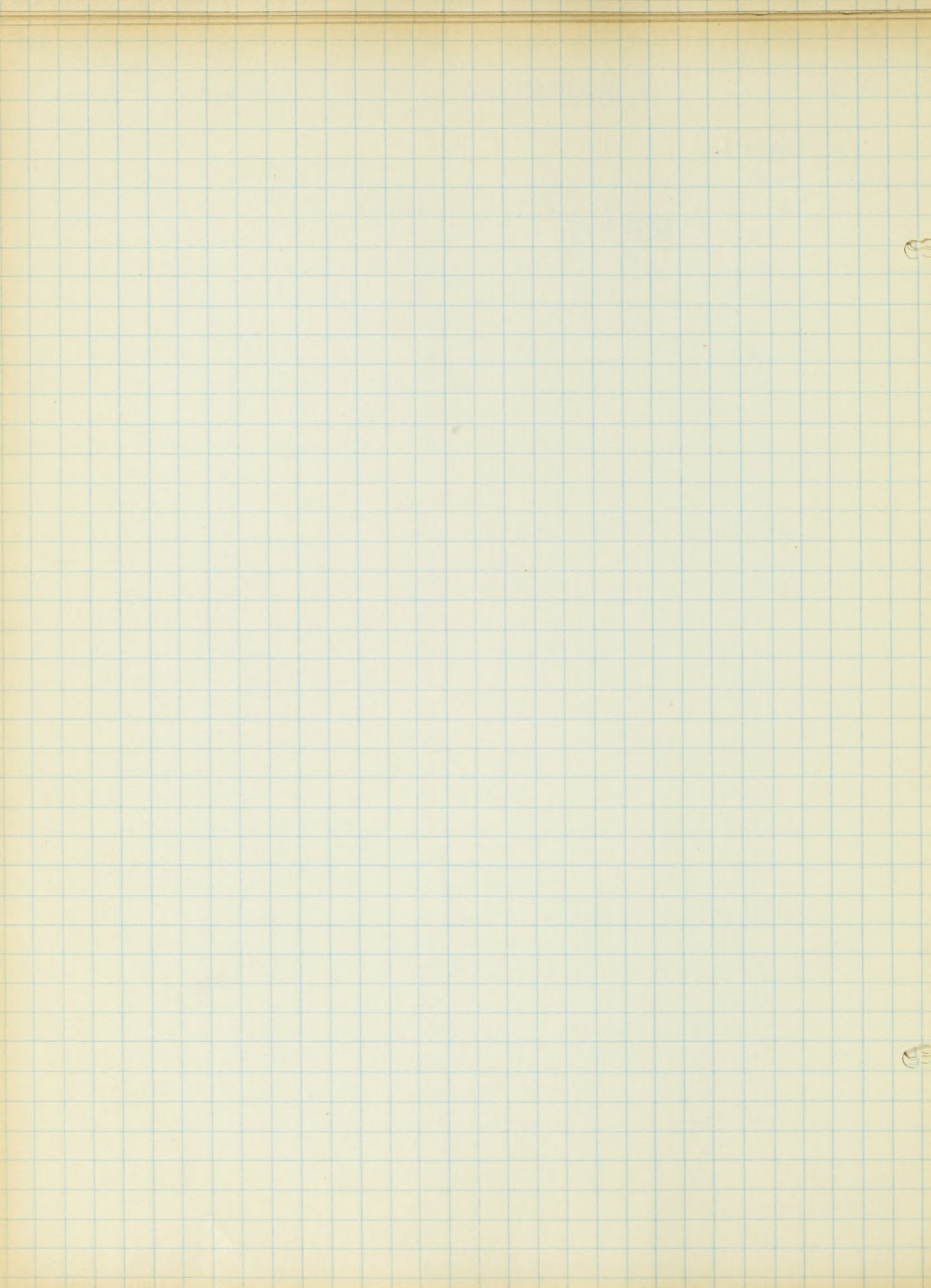
[illegible]

B	Total	0	26	32	32	10	4	4	0	0	0	108
---	-------	---	----	----	----	----	---	---	---	---	---	-----

## Check

[illegible]







I

## MULTIPLICATIONS

RULE 1.

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Group	2											B
A	C	0	1	2	3	4	5	6	7	8	9	To-
	x	0	1	2	3	4	5	6	7	8	9	tal
0												0
1			111 111 111	111	"	"						32
2			111 111 111	111	"	"						32
3												0
4												0
5												0
6												0
7												0
8												0
9												0
B	To-	2	42	12	4	4	0	0	0	0	0	64
	tal											

A	C	0	1	2	3	4	5	6	7	8	9	D
	x	0	1	2	3	4	5	6	7	8	9	To-
0												tal
1		1	21	6	2	2						32
2		1	21	6	2	2						32
3												0
4												0
5												0
6												0
7												0
8												0
9												0
B	To-	2	42	12	4	4	0	0	0	0	0	64
	tal											

Check

A	C	0	1	2	3	4	5	6	7	8	9	D
	x	0	1	2	3	4	5	6	7	8	9	To-
0			1	1								tal
1				21	21							42
2				6	6							12
3				2	2							4
4				2	2							4
5												0
6												0
7												0
8												0
9												0
BT	Total	0	32	32	0	0	0	0	0	0	0	64







Group 3

A	C	x	0	1	2	3	4	5	6	7	8	9	D
													To-
													tal
0													0
1													27
2													0
3													27
4													0
5													0
6													0
7													0
8													0
9													0

B	To-	2	24	22	4	2	0	0	0	0	0	0	54
	tal												

A	C	x	0	1	2	3	4	5	6	7	8	9	D
													To-
													tal
0													0
1													27
2													0
3													27
4													0
5													0
6													0
7													0
8													0
9													0

B	To-	2	24	22	4	2	0	0	0	0	0	0	54
	tal												

Check

A	C	x	0	1	2	3	4	5	6	7	8	9	D
													To-
													tal
0													2
1													24
2													22
3													4
4													2
5													0
6													0
7													0
8													0
9													0

B	Total	10	27	0	27	0	0	0	0	0	0	0	54
---	-------	----	----	---	----	---	---	---	---	---	---	---	----







I

Multiplications Rule I

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## GROUP 4

	C									D		
A	x	0	1	2	3	4	5	6	7	8	9	Total
	0		'			'						2
	1	      				 	 					52
	2											8
	3											0
	4											0
	5											0
	6											0
	7											0
	8											0
	9											0

B	To- tal	0	31	0	0	17	6	3	2	3	0	62
---	------------	---	----	---	---	----	---	---	---	---	---	----

											D	
A	C x	0	1	2	3	4	5	6	7	8	9	To- tal
	0		1			1						2
	1		26			12	6	3	2	3		52
	2		4			4						8
	3											0
	4											0
	5											0
	6											0
	7											0
	8											0
	9											0

B	To- tal	0	31	0	0	17	6	3	2	3	0	62
---	------------	---	----	---	---	----	---	---	---	---	---	----

Check	A	C x										D To- tal	
			0	1	2	3	4	5	6	7	8	9	
		0											0
		1	1	26	4								31
		2											0
		3											0
		4	1	12	4								17
		5		6									6
		6		3									3
		7		2									2
		8		3									3
		9											0
	B	Total	2	52	8	0	0	0	0	0	0	0	62















I

## MULTIPLICATIONS RULE I

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GROUP 6

GROUP	6										D	
A	C	0	1	2	3	4	5	6	7	8	9	To- tal
	0											0
	1											0
	2											54
	3											0
	4											0
	5											0
	6											0
	7											0
	8											0
	9											0
To- B tal		6	24	16	6	2	0	0	0	0	0	54

A	C	D									
x	0	1	2	3	4	5	6	7	8	9	Total
0											0
1											0
2	6	24	16	6	2						54
3											0
4											0
5											0
6											0
7											0
8											0
9											0
Total	6	24	16	6	2	0	0	0	0	0	54

### Check

	C	D
A	x	Total
0	6	6
1	24	24
2	16	16
3	6	6
4	2	2
5		0
6		0
7		0
8		0
9		0
B Total	0 0 54 0 0 0 0 0 0 0 0 0	54







## MULTIPLICATIONS

RULE I

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GROUP 7

A	C	x	0	1	2	3	4	5	6	7	8	9	D
													To- tal
		0											0
		1											0
		2		'	+++ +++ ++	+++ ++	+++ +++						30
		3		'	+++ +++ +++	+++ +++	+++ +++						30
		4											0
		5											0
		6											0
		7											0
		8											0
		9											0
B	To- tal	2	34	16	8	0	0	0	0	0	0	0	60

A	C	x	0	1	2	3	4	5	6	7	8	9	D
													To- tal
		0											0
		1											0
		2	1	17	8	4							30
		3	1	17	8	4							30
		4											0
		5											0
		6											0
		7											0
		8											0
		9											0
B	To- tal	2	34	16	8	9	0	0	0	0	0	0	60

Check

A	C	x	0	1	2	3	4	5	6	7	8	9	D
													To- tal
		0			1	1							2
		1			17	17							34
		2			8	8							16
		3			4	4							8
		4											0
		5											0
		6											0
		7											0
		8											0
		9											0
B	Total	0	0	30	30	0	0	0	0	0	0	0	60







## GROUP 8

		D										
A	C	0	1	2	3	4	5	6	7	8	9	To- tal
	x			"						'	'	4
	0			//// ///		+++	+++	+++	+++	'		44
	1			"								0
	2											0
	3											0
	4											0
	5											0
	6											0
	7											0
	8											0
	9											0
B	To- tal	0	0	24		5	5	5	7	2	0	48

	C										D	
A	x	0	1	2	3	4	5	6	7	8	9	To- tal
	0			2						1	1	4
	1			22		5	5	5	6	1		44
	2											0
	3											0
	4											0
	5											0
	6											0
	7											0
	8											0
	9											0
B	To- tal	0	0	44	0	5	5	5	7	2	0	48

[illegible]







I

## MULTIPLICATIONS

RULE I

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GROUP 9

A	C x											D To- tal
		0	1	2	3	4	5	6	7	8	9	
0												0
1												0
2			///	"	"	/	/		/			14
3		///	///	///	"	/	/		/			42
4												0
5												0
6												0
7												0
8												0
9												0
B	To- tal	4	28	14	4	2	2	0	2	0	0	56
A	C x											D To- tal
		0	1	2	3	4	5	6	7	8	9	
0												0
1												0
2		1	6	2	2	1	1		1			14
3		3	3	22	12	2	1	1	1			42
4												0
5												0
6												0
7												0
8												0
9												0
B	To- tal	4	28	14	4	2	2	0	2	0	0	56
A	C x											D To- tal
		0	1	2	3	4	5	6	7	8	9	
0				1	3							4
1				6	22							28
2				2	12							14
3				2	2							4
4				1	1							2
5				1	1							2
6												0
7				1	1							2
8												0
9												0
B	To- tal	0	0	14	42	0	0	0	0	0	0	56

Check







I

## MULTIPLICATIONS

RULE I

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GROUP	10											D
	C											To-
A	x	0	1	2	3	4	5	6	7	8	9	tal
	0		'''	"	'		/		"	/	/	17
	1		'''	"	'		/		"	/	/	17
	2											0
	3											0
	4											0
	5											0
	6											0
	7											0
	8											0
	9											0

[illegible][illegible]

B	Total	0	18	4	2	0	2	0	4	2	2	34
---	-------	---	----	---	---	---	---	---	---	---	---	----

A	C									D Total
x	0	1	2	3	4	5	6	7	8	9
0										0
1	9	9								18
2	2	2								4
3	1	1								2
4										0
5	1	1								2
6										0
7	2	2								4
8	1	1								2
9	1	1								2

[illegible]







I

## MULTIPLICATIONS

RULE I

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## TOTALS

## GROUP 1-10

D

TABLE 1-15													
A	C	x	0	1	2	3	4	5	6	7	8	9	To- tal
	0	2	33	14	7	2	2		4	2	1	67	
	1	4	105	82	44	30	16	12	10	5	1	309	
	2	10	76	37	19	9	1		1			153	
	3	6	58	35	10	2	1		1			113	
	4											0	
	5											0	
	6											0	
	7											0	
	8											0	
	9											0	
B	To- tal	22	272	168	80	43	20	12	16	7	2	642	

## Totals Check

D

A	C	x	0	1	2	3	4	5	6	7	8	9	To- tal
	0	2	4	10	6								22
	1	33	105	76	58								272
	2	14	82	37	35								168
	3	7	44	19	10								80
	4	2	30	9	2								43
	5	2	16	1	1								20
	6		12										12
	7	4	10	1	1								16
	8	2	5										7
	9	1	1										2
B	To- tal	67	309	153	113	0	0	0	0	0	0	0	642

## Totals of Check and Group 1-10

D

A	C	0	1	2	3	4	5	6	7	8	9	To- tal
	0	4	37	24	13	2	2		4	2	1	89
	1	37	210	158	102	30	16	12	10	5	1	581
	2	24	158	74	54	9	1		1			321
	3	13	102	54	20	2	1		1			193
	4	2	30	9	2							43
	5	2	16	1	1							20
	6		12									12
	7	4	10	1	1							16
	8	2	5									7
	9	1	1									2
B	To- tal	89	581	321	193	43	20	12	16	7	2	1284

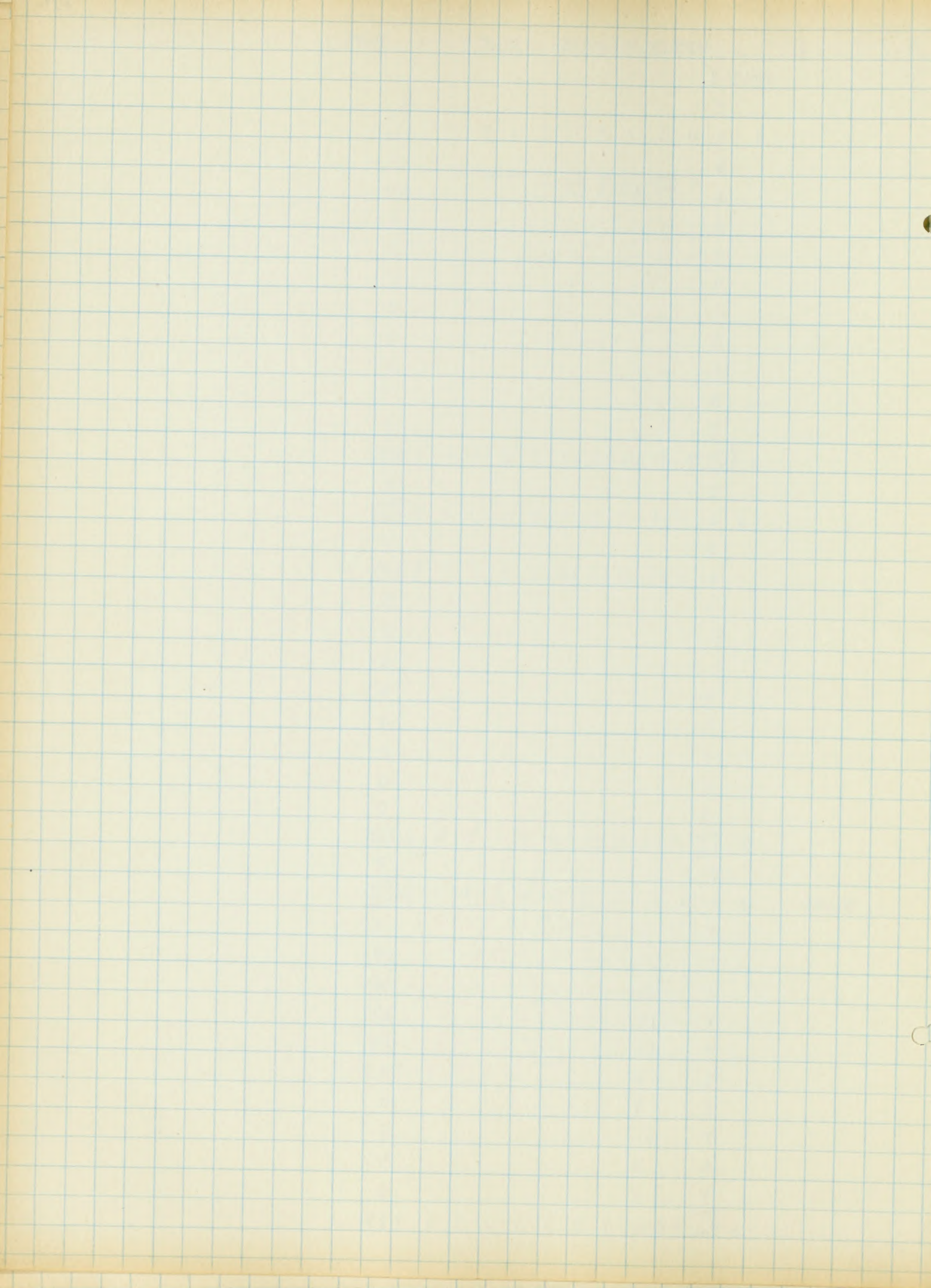








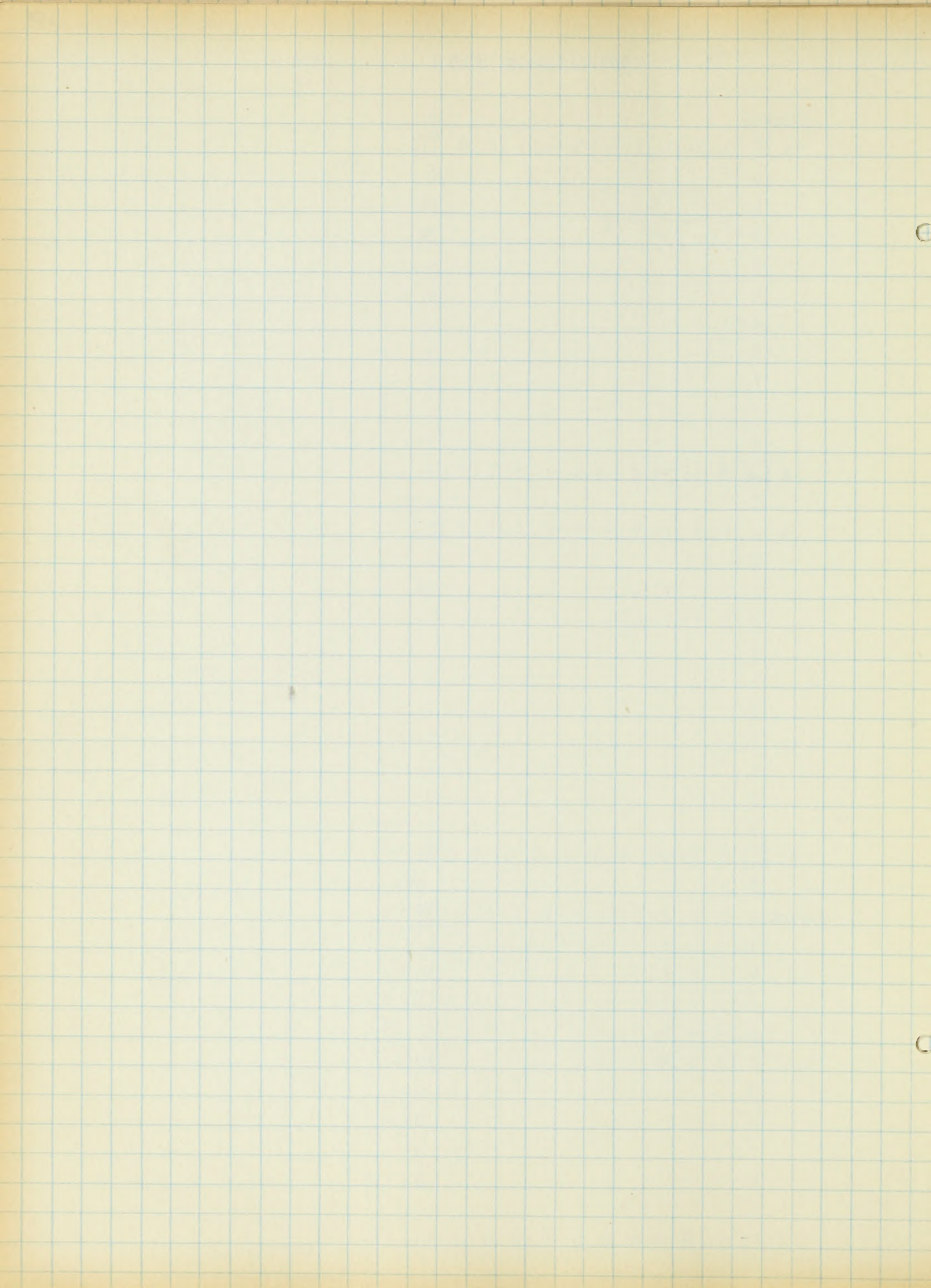














[illegible]

B	Total	4	20	20	4	0	0	0	0	0	0	48
---	-------	---	----	----	---	---	---	---	---	---	---	----

	C	D
A	x	Total
0	0	0
1	2 10 10 2	24
2		0
3	2 10 10 2	24
4		0
5		0
6		0
7		0
8		0
9		0

B	Total	4	20	20	4	0	0	0	0	0	0	48
---	-------	---	----	----	---	---	---	---	---	---	---	----

	C	D
CheckA	x 0 1 2 3 4 5 6 7 8 9	Total
	0	4
	1	20
	2	20
	3	4
	4	0
	5	0
	6	0
	7	0
	8	0
	9	0

[illegible]















II

## MULTIPLICATIONS

RULE I

PAGE 9

GROUP 5

A	C	0	1	2	3	4	5	6	7	8	9	D To-tal
0												0
1		III	III	III	III	II						25
2		III	III	III	III	II						17
3		III	II									8
4												0
5												0
6												0
7												0
8												0
9												0

B To-tal 0 24 14 8 4 0 0 0 0 0 0 50

A	C	0	1	2	3	4	5	6	7	8	9	D To-tal
0												0
1		12	7	4	2							25
2		6	5	4	2							17
3		6	2									8
4												0
5												0
6												0
7												0
8												0
9												0

B To-tal 0 24 14 8 4 0 0 0 0 0 0 50

Check	A	C	0	1	2	3	4	5	6	7	8	9	D To-tal
	0												0
	1		12	6	6								24
	2		7	5	2								14
	3		4	4									8
	4		2	2									4
	5												0
	6												0
	7												0
	8												0
	9												0
	B	To-tal	0	25	17	8	0	0	0	0	0	0	50







II

MULTIPLICATIONS

RULE I

PAGE 9

GROUP 6													D
A	C	x	0	1	2	3	4	5	6	7	8	9	To- tal
	0												0
	1												0
	2	"	/// ///	/// ///	/// ///	/// ///	"						50
	3												0
	4												0
	5												0
	6												0
	7												0
	8												0
	9												0
B	To- tal		2	20	14	12	2	0	0	0	0	0	50
GROUP 6													D
A	C	x	0	1	2	3	4	5	6	7	8	9	To- tal
	0												0
	1												0
	2	2	20	14	12	2							50
	3												0
	4												0
	5												0
	6												0
	7												0
	8												0
	9												0
B	To- tal		2	20	14	12	2	0	0	0	0	0	50
GROUP 6													D
A	C	x	0	1	2	3	4	5	6	7	8	9	To- tal
	0				2								2
	1				20								20
	2				14								14
	3				12								12
	4				2								2
	5												0
	6												0
	7												0
	8												0
	9												0
B	To- tal		0	0	50	0	0	0	0	0	0	0	50

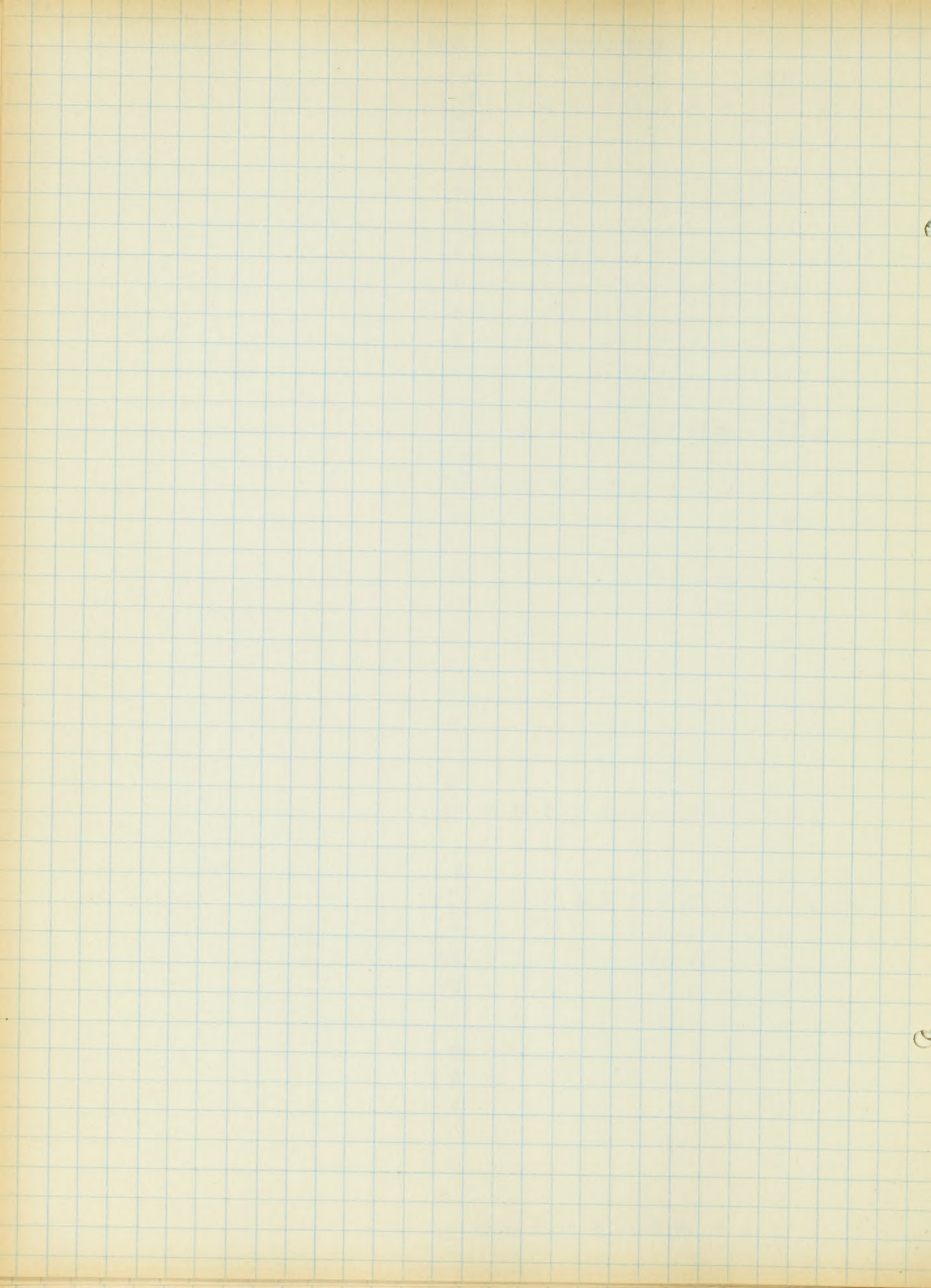






























II

## MULTIPLICATIONS

RULE I

PAGE 10

GROUP 10

GROUP 10											D	
A	C x	0	1	2	3	4	5	6	7	8	9	To- tal
	0	///	/	/	"	"	///	/	/	"		13
	1	///	/	/	"	"	///	/	/	"		13
	2											0
	3											0
	4											0
	5											0
	6											0
	7											0
	8											0
	9											0
B	To- tal	0	10	2	2	4	4	6	2	2	4	36

		D										
		C										
		0	1	2	3	4	5	6	7	8	9	Total
A	x	0	1	2	3	4	5	6	7	8	9	Total
	0		5	1	1	2	2	3	1	1	2	18
	1		5	1	1	2	2	3	1	1	2	18
	2											0
	3											0
	4											0
	5											0
	6											0
	7											0
	8											0
9											0	
B	Total	0	10	2	2	4	4	6	2	2	4	36

		D											
		C											
		0	1	2	3	4	5	6	7	8	9	To- tal	
Check	A	x	0	1	2	3	4	5	6	7	8	9	To- tal
		0											0
		1	5	5									10
		2	1	1									2
		3	1	1									2
		4	2	2									4
		5	2	2									4
		6	3	3									6
		7	1	1									2
		8	1	1									2
		9	2	2									4
	B	To- tal	18	18	0	0	0	0	0	0	0	0	36







II MULTIPLICATIONS RULE I PAGE 10

TOTALS	GROUP 1-10	D
A	C	To-tal
x	0 1 2 3 4 5 6 7 8 9	
0	7 1 1 3 2 3 1 2 2	22
1	5 76 82 48 41 19 18 17 9	2 317
2	5 51 34 30 13	133
3	4 30 19 5	58
4		0
5		0
6		0
7		0
8		0
9		0
B	To-tal	14 164 136 84 57 21 21 18 11 4 530

Totals	Checks	D
A	C	To-tal
x	0 1 2 3 4 5 6 7 8 9	
0	5 5 4	14
1	7 76 51 30	164
2	1 82 34 19	136
3	1 48 30 5	84
4	3 41 13	57
5	2 19	21
6	3 18	21
7	1 17	18
8	2 9	11
9	2 2	4
B	To-tal	22 317 133 58 0 0 0 0 0 0 530

Totals	- Group 1-10 and Checks	D
A	C	To-tal
x	0 1 2 3 4 5 6 7 8 9	
0	12 6 5 3 2 3 1 2 2	36
1	12 152 133 78 41 19 18 17 9	2 481
2	6 133 68 49 13	269
3	5 78 49 10	142
4	3 41 13	57
5	2 19	21
6	3 18	21
7	1 17	18
8	2 9	11
9	2 2	4
B	To-tal	36 481 269 142 57 21 21 18 11 4 1060







III

MULTIPLICATIONS RULE I

PAGE 12

## GROUP III

A	C x											D Total
		0	1	2	3	4	5	6	7	8	9	
0		/	/	//		/		/	/	/	/	9
1			///	///	///	///	///	///	/	//		46
2			///	///	///		///	///	/	/		39
3		/	//	/		//		/	/			8
4		/	//		///		/	/		/		11
5			///	///	//			/		/		14
6			/	///	/	/						8
7			//	///	//	/						10
8				///	//	//	/				/	9
9												0

B Total 3 28 45 28 11 13 14 4 6 2 154

A	C x											D Total
		0	1	2	3	4	5	6	7	8	9	
0	1	1	2		1		1	1	1	1	1	9
1		10	14	5	4	5	5	1	2			46
2		5	10	11		6	5	1	1			39
3	1	2	1		2		1	1				8
4	1	2		5		1	1		1			11
5		5	5	2			1		1			14
6		1	5	1	1							8
7		2	5	2	1							10
8			3	2	2	1				1		9
9												0

B Total 3 28 45 28 11 13 14 4 6 2 154

Check A	C x											D Total
		0	1	2	3	4	5	6	7	8	9	
0	1				1	1						3
1	1	10	5	2	2	5	1	2				28
2	2	14	10	1		5	5	5	3			45
3		5	11		5	2	1	2	2			28
4	1	4		2			1	1	2			11
5		5	6		1				1			13
6	1	5	5	1	1	1						14
7	1	1	1	1	1							4
8	1	2	1		1	1						6
9	1								1			2

B Total 9 46 39 8 11 14 8 10 9 154







IV.

## MULTIPLICATIONS

RULE I

PAGE 13

## GROUP IV

A	C	x	0	1	2	3	4	5	6	7	8	9	D
													To- tal
0													0
1						"							2
2					///	///	///	/	///	///	///		20
3					/		///	///	/	/	///	/	14
4						///	///	///	///	/	/	/	23
5					/	///	///	///	///		///	/	19
6					/	/	/		/	/	/		6
7					"	///			///	/		///	10
8							/	///	/	/		/	6
9													0

B To-  
tal 0 0 8 21 13 17 16 8 11 6 100

A	C	x	0	1	2	3	4	5	6	7	8	9	D
													To- tal
0													0
1					2								2
2				3	3	3	1	5	3	2			20
3				1		3	2	1	1	5	1		14
4					6	3	9	2	1	1	1		23
5				1	6	2	3	4		2	1		19
6				1	1	1		1	1	1			6
7				2	3			2	1		2		10
8						1	2	1	1		1		6
9													0

B To-  
tal 0 0 8 21 13 17 16 8 11 6 100

Check

A	C	x	0	1	2	3	4	5	6	7	8	9	D
													To- tal
0													0
1													0
2				3	1		1	1	2				8
3			2	3		6	6	1	3				21
4				3	3	3	2	1		1			13
5				1	2	9	3			2			17
6				5	1	2	4	1	2	1			16
7				3	1	1		1	1	1			8
8				2	5	1	2	1					11
9					1	1	1		2	1			6

B To-  
tal 0 2 20 14 23 19 6 10 6 0 100







V MULTIPLICATIONS RULE I PAGE

GROUP	V	C	0	1	2	3	4	5	6	7	8	9	D
A	x		0	1	2	3	4	5	6	7	8	9	To- tal
	0												0
	1		"	///	////	////	///	/	///		/	///	29
	2			///	///	///		/				///	20
	3			///	///	///	/	"	/	/			17
	4		"	///		///	/		"				12
	5		///				/	/	/				6
	6		/				/						2
	7		/									/	2
	8		"			/		/					4
	9												0

B To-  
tal 0 11 18 17 19 6 7 4 2 8 92

A	x	0	1	2	3	4	5	6	7	8	9	D
	0											To- tal
	1		2	5	7	7	1	3		1	3	29
	2			5	5	5	1				4	20
	3			4	5	3	1	2	1	1		17
	4		2	4		3	1		2			12
	5		3				1	1	1			6
	6		1				1					2
	7		1								1	2
	8		2			1		1				4
	9											0

B To-  
tal 0 11 18 17 19 6 7 4 2 8 92

Check	A	x	0	1	2	3	4	5	6	7	8	9	D
		0											To- tal
		1		2			2	3	1	1	2		11
		2		5	5	4	4						18
		3		7	5	5							17
		4		7	5	3	3				1		19
		5		1	1	1	1	1	1				6
		6		3		2		1			1		7
		7				1	2	1					4
		8		1		1							2
		9		3	4					1			8

B To-  
tal 0 29 20 17 12 6 2 2 4 0 92







VI

MULTIPLICATIONS

RULE I

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GROUP VI

A	C	x	0	1	2	3	4	5	6	7	8	9	D
													To- tal
0													0
1						/	/	"	/				5
2						/	/	"	/				12
3						/	////	/	////	"			21
4				"	///	////	"	"	///	/			19
5				/	/	///	///	////	////				21
6				"	////	////	////	"	///				10
7				"	"	"	/	"	/				9
8				/	/	////		/	"				11
9				"	"	"	"			/	"		0

B	To- tal	0	10	14	28	16	20	16	2	2	0	108
---	------------	---	----	----	----	----	----	----	---	---	---	-----

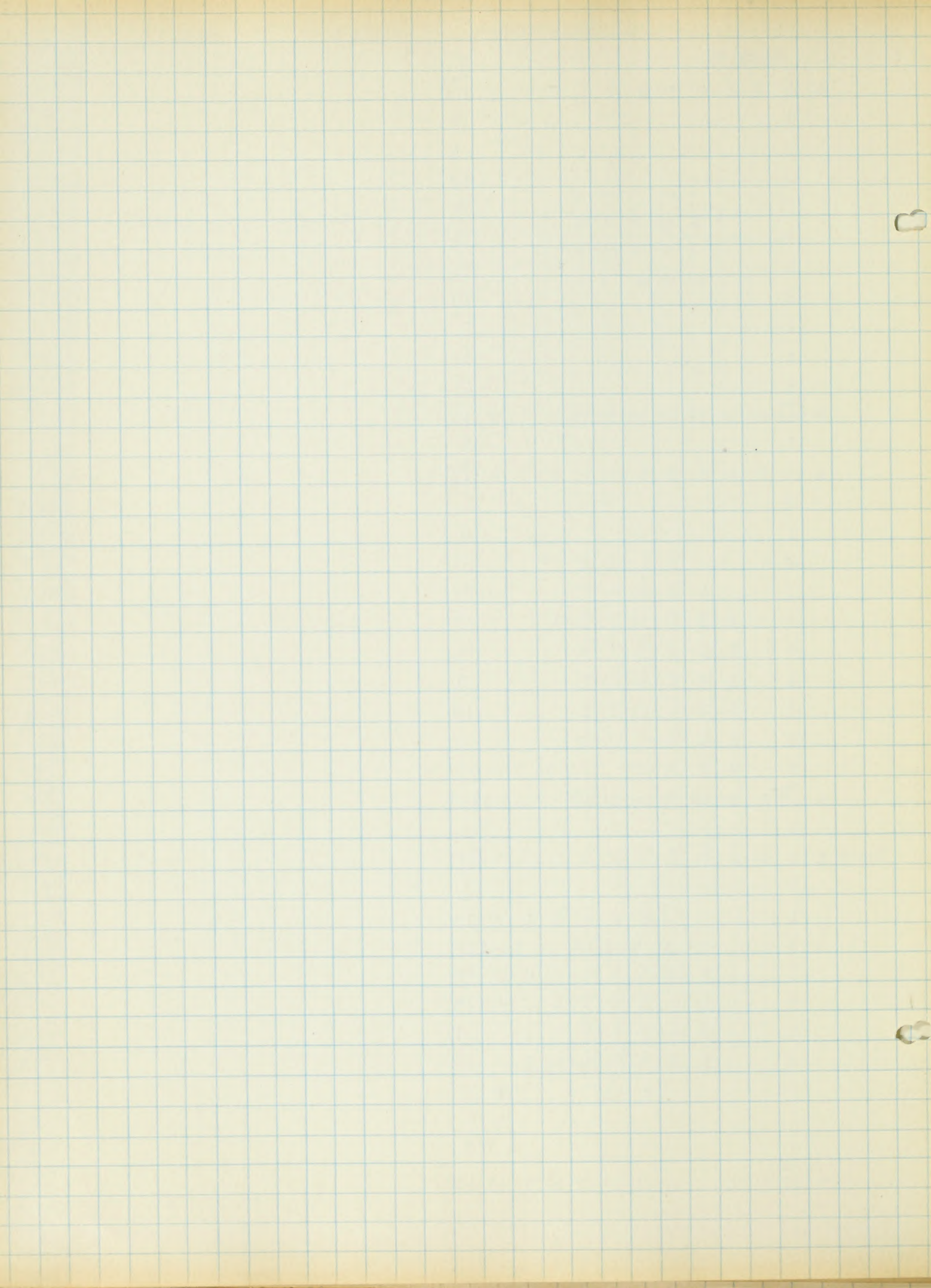
A	C	x	0	1	2	3	4	5	6	7	8	9	D
													To- tal
0													0
1													0
2					1	1	2	1					5
3				1	4	1	4	2					12
4			2	3	7	3	2	3	1				21
5			1	1	3	3	7	4					19
6			2	4	5	5	2	3					21
7			2	2	2	1	2	1					10
8			1	1	4		1	2					9
9			2	2	2	2			1	2			11

B	To- tal	0	10	14	28	16	20	16	2	2	0	108
---	------------	---	----	----	----	----	----	----	---	---	---	-----

Check A	C	x	0	1	2	3	4	5	6	7	8	9	D
													To- tal
0													0
1						2	1	2	2	1	2		10
2					1	3	1	4	2	1	2		14
3			1	4	7	3	5	2	4	2			28
4			1	1	3	3	5	1		2			16
5			2	4	2	7	2	2	1				20
6			1	2	3	4	3	1	2				16
7					1					1	2		2
8										2	2		2
9												0	0

B	To- tal	0	0	5	12	21	19	21	10	9	11	108
---	------------	---	---	---	----	----	----	----	----	---	----	-----







VII

MULTIPLICATIONS RULE I

PAGE 16

GROUP VII

A	C x											D To- tal
		0	1	2	3	4	5	6	7	8	9	
0				"		///	"	"	///			19
1		///	///	///	///	///	1	1	"			69
2		///	///	///	///	///						50
3		///	///	///	///	///						34
4				1	///	1						5
5				"		1						3
6						///	1					0
7												3
8												0
9												0

B	To- tal	0	42	70	30	29	3	3	6	0	0	183
---	------------	---	----	----	----	----	---	---	---	---	---	-----

A	C x											D To- tal
		0	1	2	3	4	5	6	7	8	9	
0				2		9	2	2	4			19
1			13	30	11	11	1	1	2			69
2			13	20	11	6						50
3			16	15	3							34
4				1	3	1						5
5				2		1						3
6												0
7					2	1						3
8												0
9												0

B	To- tal	0	42	70	30	29	3	3	6	0	0	183
---	------------	---	----	----	----	----	---	---	---	---	---	-----

A	C x											D To- tal
		0	1	2	3	4	5	6	7	8	9	
0												0
1			13	13	16							42
2	2		30	20	15	1	2					70
3			11	11	3	3			2			30
4	9		11	6		1	1		1			29
5	2	1										3
6	2	1										3
7	4	2										6
8												0
9												0

B	To- tal	19	69	50	34	5	3	0	3	0	0	183
---	------------	----	----	----	----	---	---	---	---	---	---	-----







VIII

## MULTIPLICATIONS

RULE I

PAGE 17

GROUP VIII

A	C x											D To- tal
		0	1	2	3	4	5	6	7	8	9	
0												0
1			///	/			/		/			6
2		///	///	///	//		/	///	/			27
3		///	//	/	/		/	/				9
4		///	///	///	/				//		/	18
5		///	///	///	///	//	/	/	/			23
6		///	/	///	/	/	/			//	/	11
7		/	//	///	//		/	/	/			12
8		/	/	///	//	//		/	/	/	/	11
9		//	//	///		/			//	/		10

B To- tal	0	24	24	39	10	6	5	12	4	3	127
--------------	---	----	----	----	----	---	---	----	---	---	-----

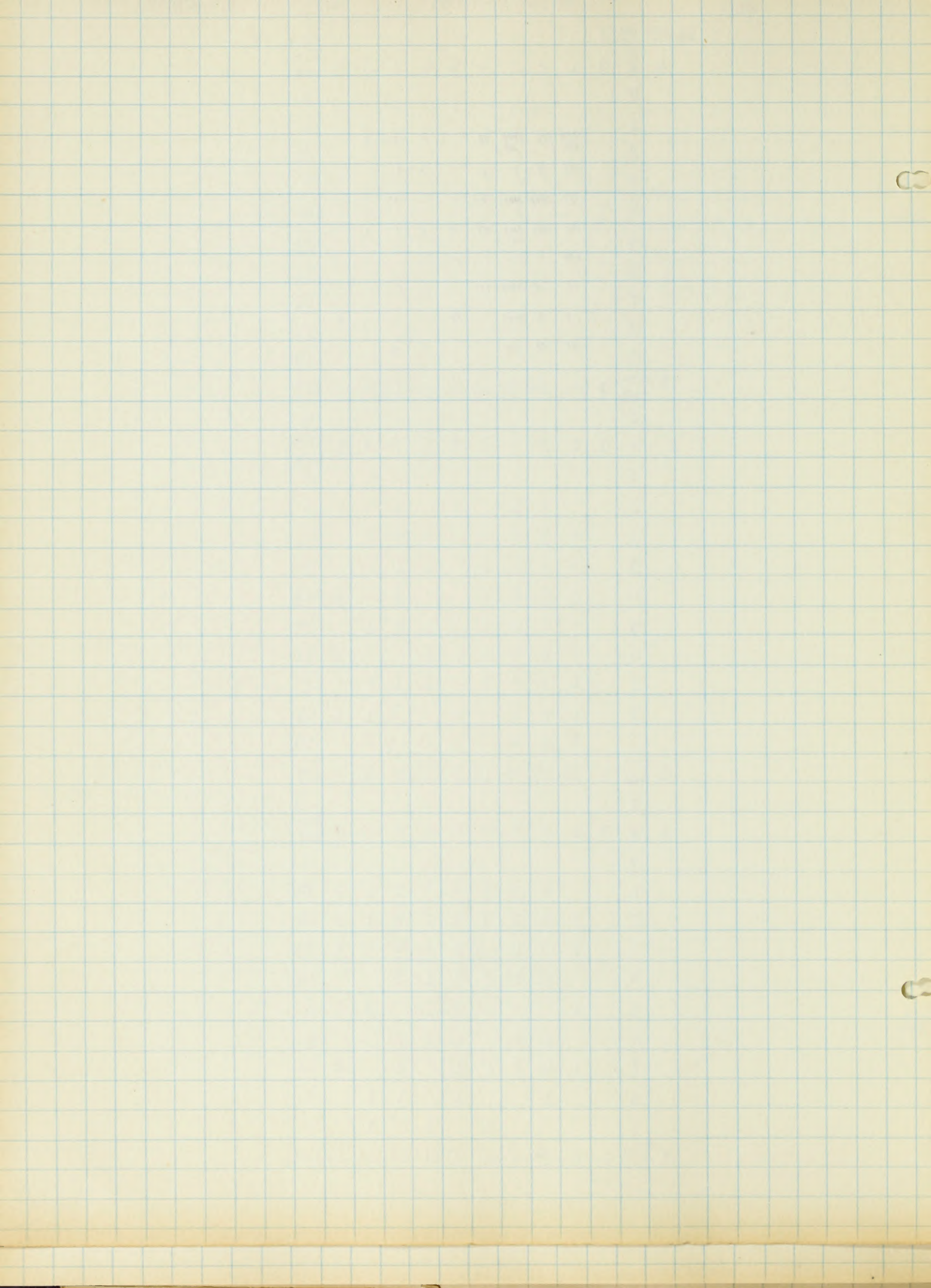
A	C x											D To- tal
		0	1	2	3	4	5	6	7	8	9	
0												0
1			3	1		1		1				6
2		8	3	8	2		1	4	1			27
3		3	2	1	1		1	1				9
4		3	5	6	1			2		1		18
5		3	5	7	3	2	1	1	1			23
6		3	1	3	1	1	1			1		11
7		1	2	4	2		1	1	1			12
8		1	1	5		2			1	1		11
9		2	2	4				2				10

B To- tal	0	24	24	39	10	6	5	12	4	3	127
--------------	---	----	----	----	----	---	---	----	---	---	-----

A	C x											D To- tal
		0	1	2	3	4	5	6	7	8	9	
0												0
1			8	3	3	3	3	1	1	2		24
2		3	3	2	5	5	1	2	1	2		24
3		1	8	1	6	7	3	4	5	4		39
4			2	1	1	3	1	2				10
5		1				2	1		2			6
6			1	1		1	1	1				5
7		1	4	1	2	1		1		2		12
8			1			1		1	1			4
9					1		1		1			3

B To- tal	0	6	27	9	18	23	11	12	11	10	127
--------------	---	---	----	---	----	----	----	----	----	----	-----

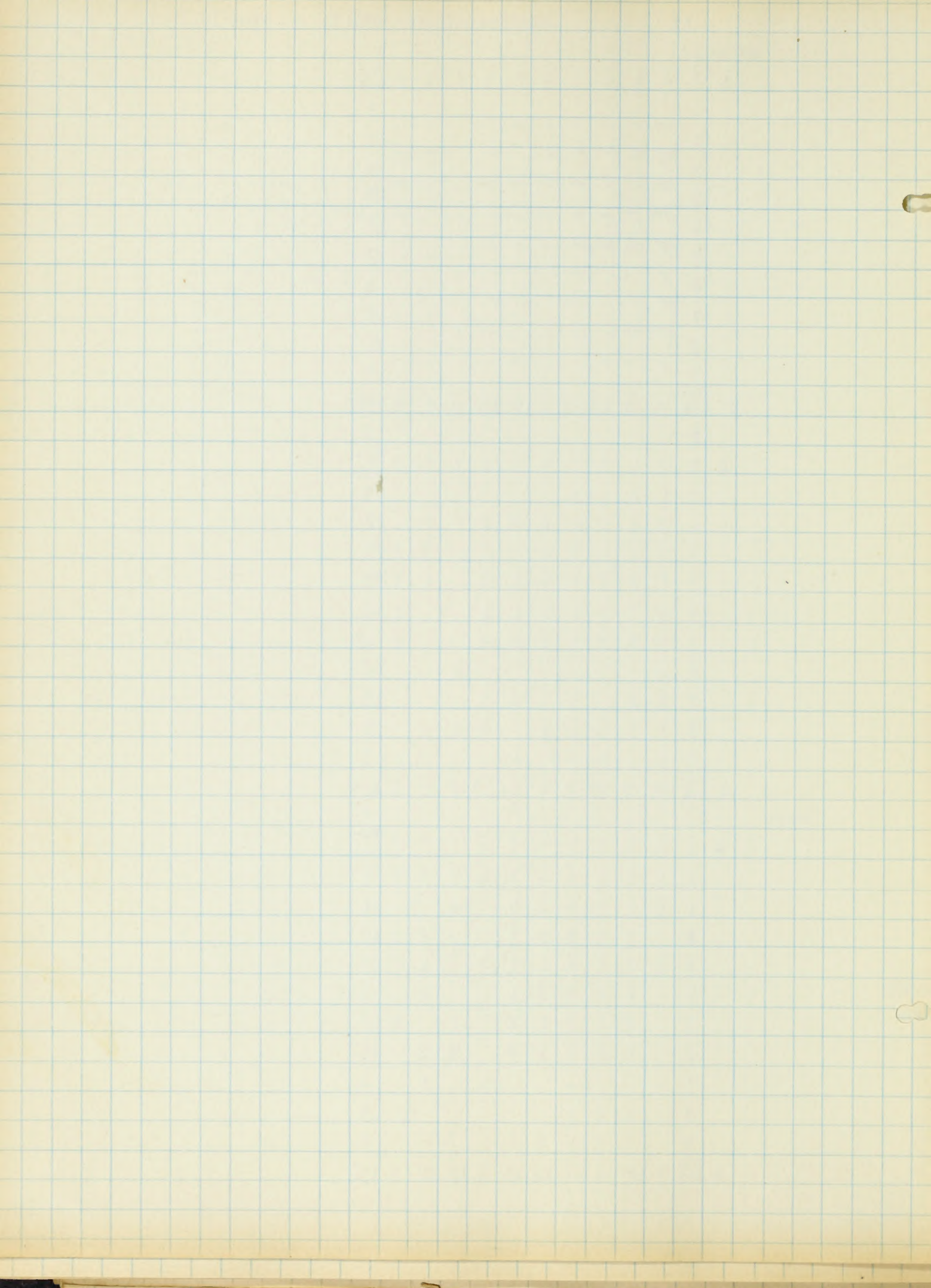






		MULTIPLICATIONS										RULE I		PAGE 19	
GROUP IX		IX										D			
A	C	0	1	2	3	4	5	6	7	8	9	To-	tal		
0		'	'		'								3		
1		+++	"	///	"	'	"	'		'			17		
2		+++	///	+++	///	"		"		///	///		30		
3		+++	"	///	///	'	///	"		'	'		24		
4		+++	"	"	'	"	'	'			"		16		
5		+++	///	///	///	'	'	///			"		23		
6		"			///					'			6		
7		+++	"		///		"	///					15		
8		+++	///	"	///	'		"	'				21		
9		'		'			'						3		
B To-		tal	49	21	19	23	8	10	13	2	5	8	158		
												D			
A	x	0	1	2	3	4	5	6	7	8	9	To-	tal		
0		1	1		1								3		
1		5	2	3	2	1	2	1		1			17		
2		9	3	5	3	2		2		3	3		30		
3		7	2	3	4	1	3	2		1	1		24		
4		5	2	2	1	2	1	1			2		16		
5		7	4	3	3	1	1	2			2		23		
6		2			3				1				6		
7		5	2		3		2	3					15		
8		7	5	2	3	1		2	1				21		
9		1		1			1						3		
B To-		tal	49	21	19	23	8	10	13	2	5	8	158		
Check												D			
A	x	0	1	2	3	4	5	6	7	8	9	To-	tal		
0		1	5	9	7	5	7	2	5	7	1		49		
1		1	2	3	2	2	4		2	5			21		
2			3	5	3	2	3			2	1		19		
3		1	2	3	4	1	3	3	3	3			23		
4			1	2	1	2	1			1			8		
5			2		3	1	1		2		1		10		
6			1	2	2	1	2		3	2			13		
7								1		1			2		
8			1	3	1								5		
9				3	1	2	2						8		
B To-		tal	3	17	30	24	16	23	6	15	21	3	158		







IX

## MULTIPLICATIONS RULE I

PAGE 21

GROUP IX		EXCEPTIONS 1.										D
A	C	0	1	2	3	4	5	6	7	8	9	To- tal
0												0
1		///		/	/	/					///	14
2		///	///	/		/			/	///		40
3		///				/				/	///	11
4		///	/		/	/				"	"	11
5		"		/						/	"	6
6						/		/			"	4
7		/									/	2
8		/									/	2
9			///									2

B	To- tal	0	41	4	2	3	4	0	2	8	28	92
---	------------	---	----	---	---	---	---	---	---	---	----	----

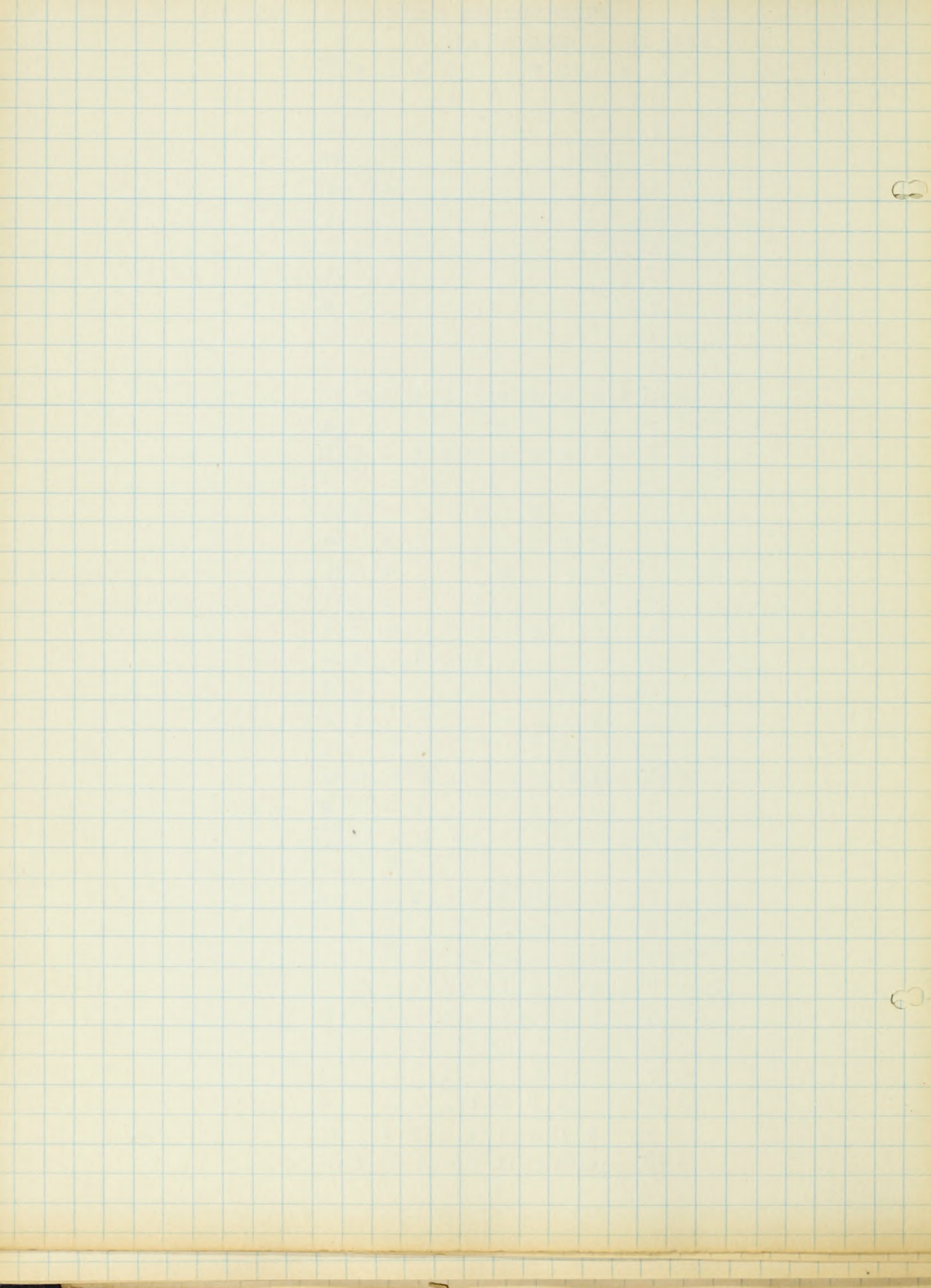
A	C	0	1	2	3	4	5	6	7	8	9	To- tal
0												0
1		6		1	1	1					5	14
2		22	1			1		1	4			40
3		5			1				1	4		11
4		4	1		1	1			2	2		11
5		2		1					1	2		6
6						1		1		2		4
7		1								1		2
8		1								1		2
9			2									2

B	To- tal	0	41	4	2	3	4	0	2	8	28	92
---	------------	---	----	---	---	---	---	---	---	---	----	----

A	C	0	1	2	3	4	5	6	7	8	9	To- tal
0												0
1		6	22	5	4	2			1	1		41
2			1		1						2	4
3		1				1						2
4		1		1	1							3
5		1	1		1		1					4
6												0
7			1				1					2
8			4	1	2	1						8
9		5	11	4	2	2	2	1	1			28

B	To- tal	0	14	40	11	11	6	4	2	2	2	92
---	------------	---	----	----	----	----	---	---	---	---	---	----







## TOTALS MULTIPLICATIONS RULE L PAGE 12-21

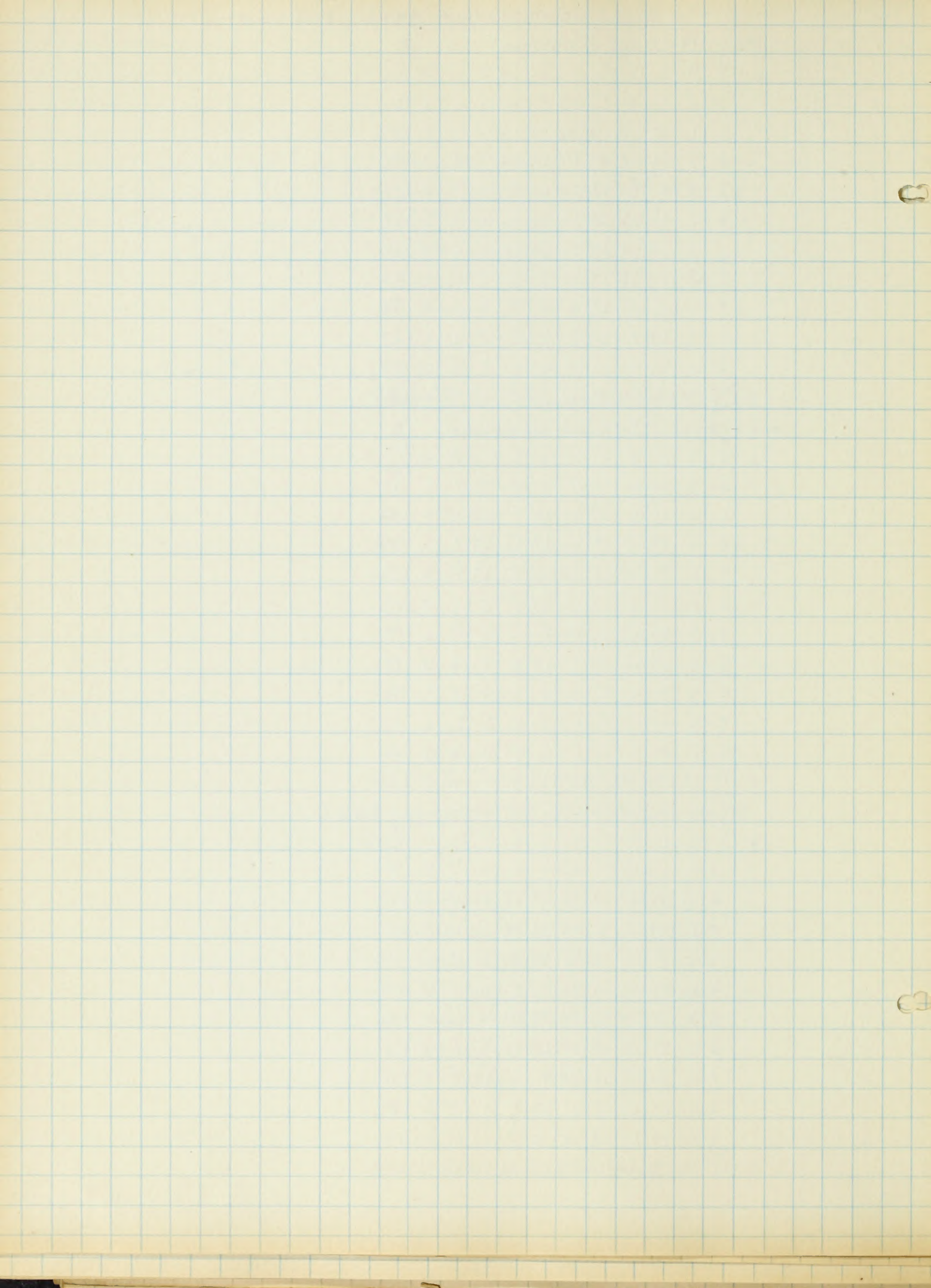
GROUP	III-IX and exceptions	D
A	C x	To- tal
	0 1 2 3 4 5 6 7 8 9	
	0 2 2 4 1 10 2 3 5 1 1	31
	1 11 27 56 29 24 10 10 4 4 8	183
	2 9 61 47 42 19 12 14 9 11 7	231
	3 8 28 27 17 12 10 9 4 8 6	129
	4 6 15 16 28 14 15 7 6 4 6	117
	5 7 18 17 22 10 14 13 2 5 5	113
	6 2 7 11 13 8 5 5 3 1 3	58
	7 12 13 13 8 2 6 5 1 4 6	64
	8 7 10 7 14 5 6 6 2 1 4	62
	9 1 4 7 6 2 1 0 3 2 0	26
B	To- tal	5318420518511277734338441014

Check - Group	III-IX and exceptions	D
A	C x	To- tal
	0 1 2 3 4 5 6 7 8 9	
	0 2 11 9 8 6 7 2 0 7 1	53
	1 2 27 61 28 15 18 7 12 10 4	184
	2 4 56 47 27 16 17 11 13 7 7	205
	3 1 29 42 17 28 22 13 13 14 6	185
	4 10 24 19 12 14 10 8 8 5 2	112
	5 2 10 12 10 15 14 5 2 6 1	77
	6 3 10 14 9 7 13 5 6 6 0	73
	7 5 4 9 4 6 2 3 5 2 3	43
	8 1 4 11 8 4 5 1 1 1 2	38
	9 1 8 7 6 6 5 3 4 4 0	44
B	To- tal	31183231129117113586462261014

## TOTALS GROUPS III-IX EXCEPTIONS AND CHECKS

A	C x	D
	0 1 2 3 4 5 6 7 8 9	Total
	0 4 13 13 9 16 9 5 5 8 2	84
	1 13 54 117 57 39 28 17 16 14 12	367
	2 13 117 94 69 35 29 25 22 18 14	436
	3 9 57 69 34 40 32 22 17 22 12	314
	4 16 39 35 40 28 25 15 14 9 8	229
	5 9 28 29 32 25 28 18 4 11 6	190
	6 5 17 25 22 15 18 10 9 7 3	131
	7 5 16 22 17 14 4 9 10 3 7	107
	8 8 14 18 22 9 11 7 3 2 6	100
	9 2 12 14 12 8 6 3 7 6 0	70
B	To- tal	84367436314229190131107100702028







## X MULTIPLICATIONS

## RULE II

PAGE 23

GROUP X - Set 1

A	x	0	1	2	3	4	5	6	7	8	9	D To- tal
0												0
1				'	"							3
2				'	"	'						4
3					"	""						6
4			"	'			"		""	'		9
5			'		""	'	'		"	"		10
6					""	""	"		""	'		19
7			"	'	'	"		'	"			10
8				""	""	""	"	'	""	"		24
9			""	"	"		'		"	""		19

B To-  
tal 0 12 10 22 24 8 2 16 10 0 104

A	x	0	1	2	3	4	5	6	7	8	9	D To- tal
0												0
1			1	2								3
2			1	2	1							4
3				2	4							6
4		2	1			2		3	1			9
5		1		3	1	1		2	2			10
6				5	8	2		3	1			19
7		2	1	1	3		1	2				10
8			4	5	7	2	1	3	2			24
9		7	2	2		1		3	4			19

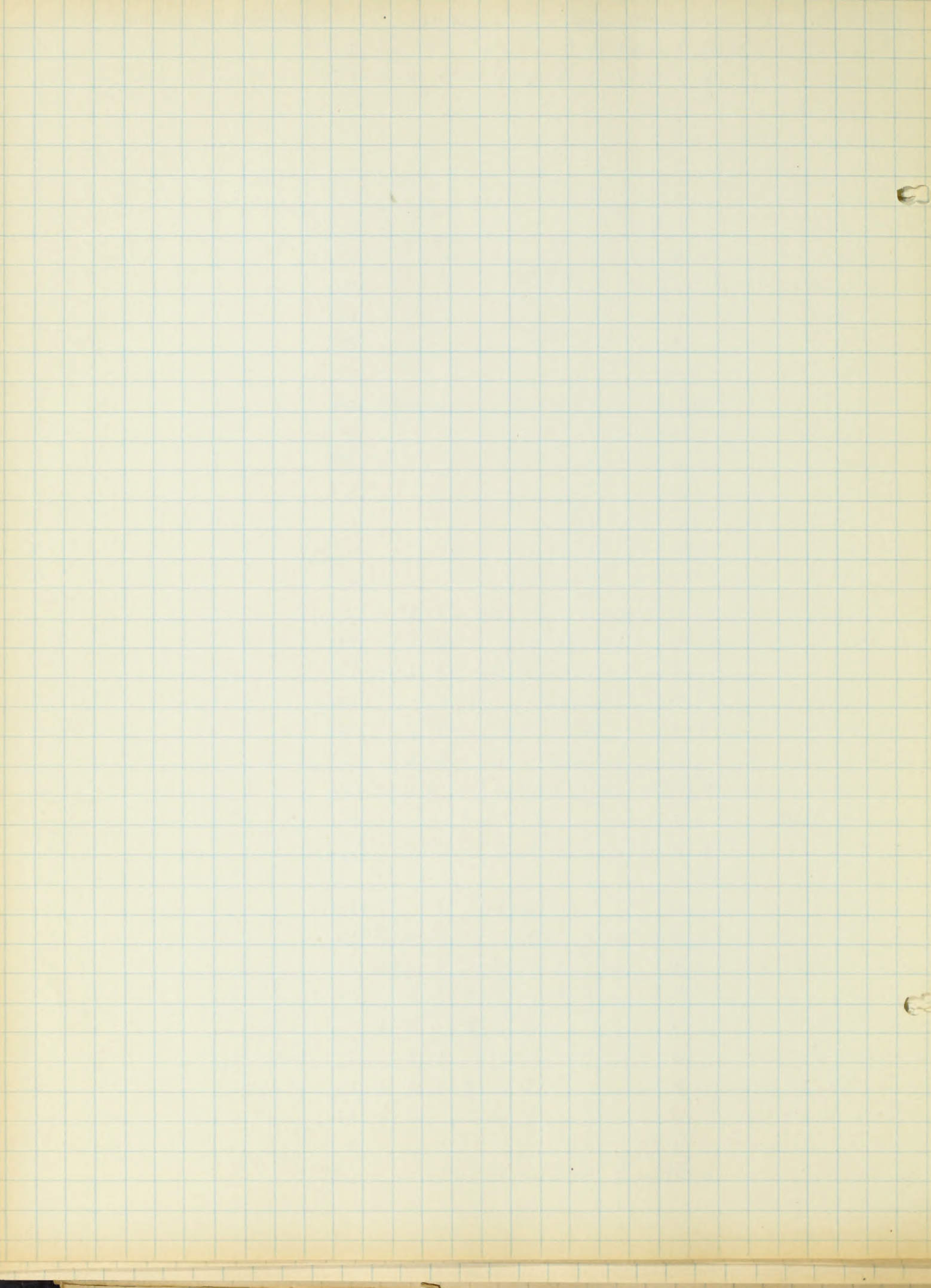
B To-  
tal 0 12 10 22 24 8 2 16 10 0 104

Check

A	x	0	1	2	3	4	5	6	7	8	9	D To- tal
0												0
1					2	1		2		7		12
2		1	1		1			1	4	2		10
3		2	2	2		3	5	1	5	2		22
4			1	4		1	8	3	7			24
5					2	1	2		2	1		8
6								1	1			2
7					3	2	3	2	3	3		16
8					1	2	1		2	4		10
9												0

B To-  
tal 0 3 4 6 9 10 19 10 24 19 104







## X MULTIPLICATIONS RULE II

PAGE 24

GROUP	X	C	Set 2.										D
A	x		0	1	2	3	4	5	6	7	8	9	To- tal
	0												0
	1												0
	2		/		/								2
	3		/	/	"			/	/				6
	4												0
	5							/	/				2
	6									///			3
	7		///	///				/	/				10
	8		/	/				/	/		/		5
	9		/	/	/	/							4

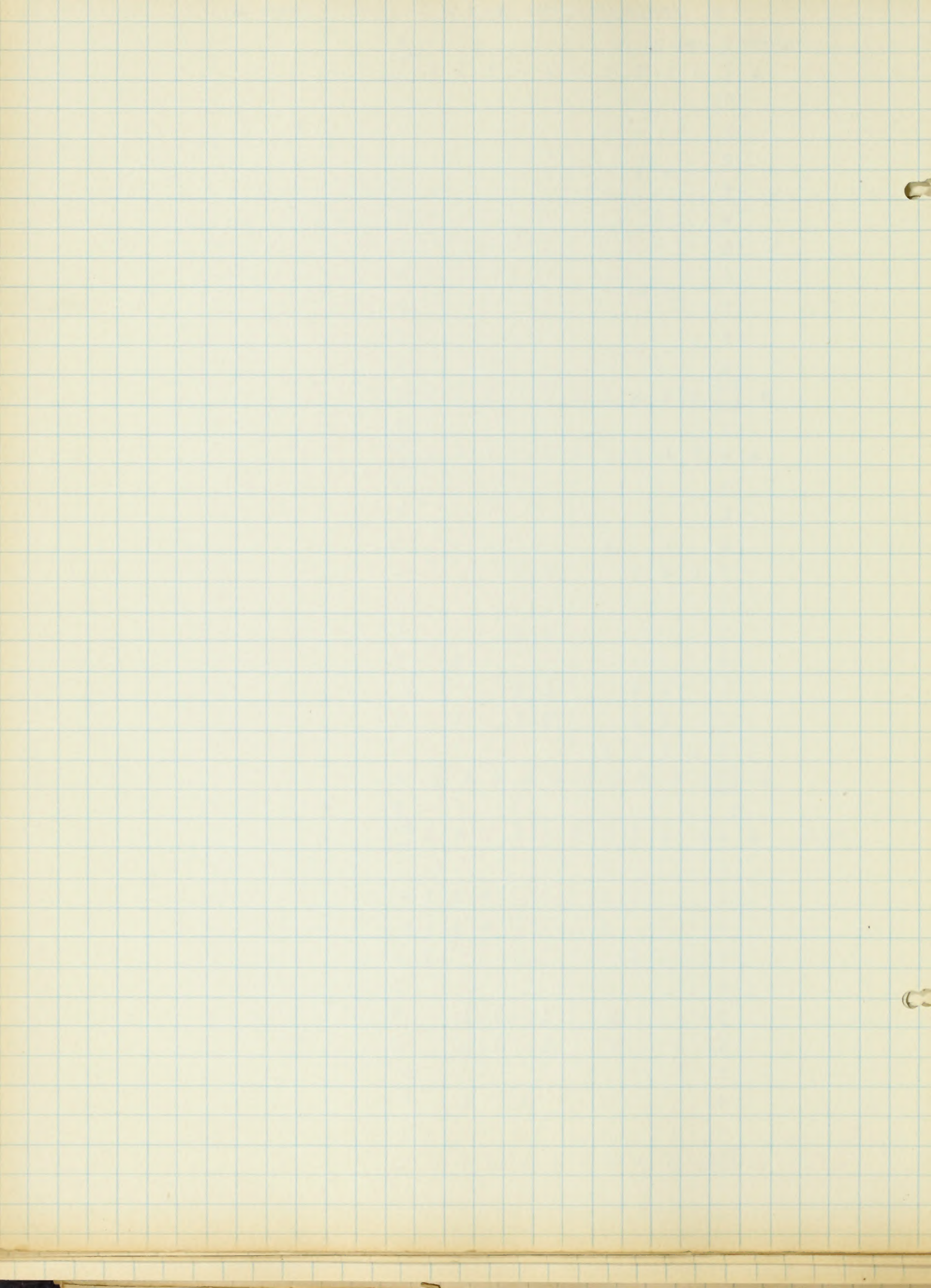
B	To- tal	2	8	8	2	0	4	4	0	4	0	32
---	------------	---	---	---	---	---	---	---	---	---	---	----

	C											D
A	x	0	1	2	3	4	5	6	7	8	9	To- tal
	0											0
	1											0
	2		1		1							2
	3	1	1	2			1	1				6
	4											0
	5						1	1				2
	6									3		3
	7		4	4			1	1				10
	8		1	1			1	1		1		5
	9	1	1	1	1							4

B	To- tal	2	8	8	2	0	4	4	0	4	0	32
---	------------	---	---	---	---	---	---	---	---	---	---	----

C												D	
Check	A	x	0	1	2	3	4	5	6	7	8	9	To- tal
		0				1						1	2
		1			1	1				4	1	1	8
		2				2				4	1	1	8
		3			1							1	2
		4											0
		5				1		1		1	1		4
		6				1		1		1	1		4
		7											0
		8							3		1		4
		9											0
	B	To- tal	0	0	2	6	0	2	3	10	5	4	32







## X MULTIPLICATIONS

## RULE II

PAGE 24

GROUP X Set. 3.

A	C	0	1	2	3	4	5	6	7	8	9	D
	x											To- tal
0												0
1				'				'	'''			6
2			'	'''	'	''			'	'	'	12
3			''	'	'	'						5
4		'	'									2
5										'	'	2
6					'							1
7			'''		''	'	'	''			'	10
8		'	'''	'	''	'''	'		''	'	'	15
9			'''	''	'''	'		''	'''		'	17

B	To- tal	2	10	10	12	8	4	4	12	3	5	70
---	------------	---	----	----	----	---	---	---	----	---	---	----

A	C	0	1	2	3	4	5	6	7	8	9	D
	x											To- tal
0												0
1				1	1			1	3			6
2			1	2	3	1	2		1	1	1	12
3			2	1	1	1						5
4		1	1									2
5										1	1	2
6					1							1
7				3		2	1	1	2		1	10
8		1	3	1	2	3	1		2	1	1	15
9			3	2	4	1		2	4		1	17

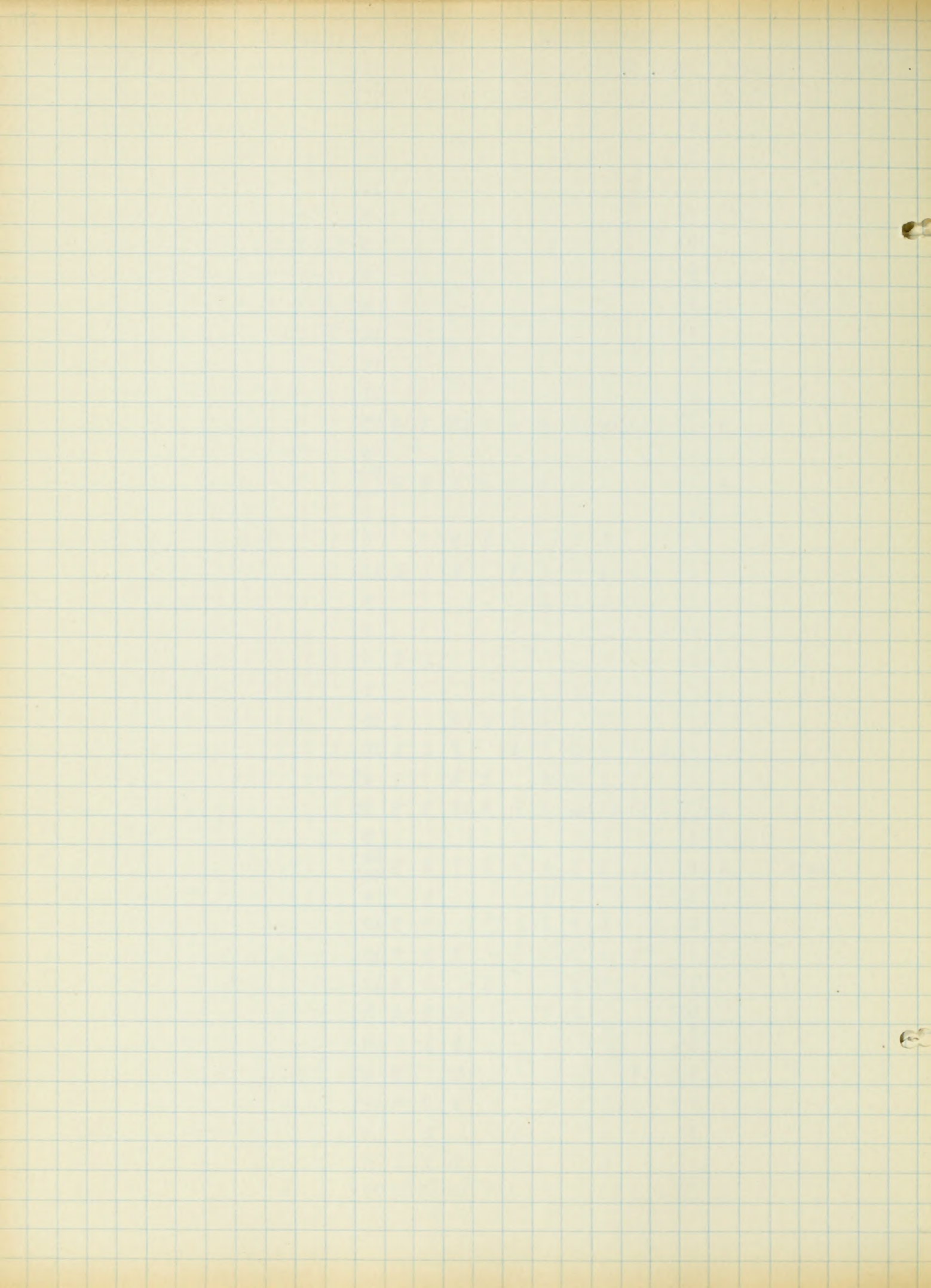
B	To- tal	2	10	10	12	8	4	4	12	3	5	70
---	------------	---	----	----	----	---	---	---	----	---	---	----

A	C	0	1	2	3	4	5	6	7	8	9	D
	x											To- tal
0						1				1		2
1				1	2	1				3	3	10
2			1	2	1				3	1	2	10
3			1	3	1			1		2	4	12
4				1	1				2	3	1	8
5				2					1	1		4
6			1						1		2	4
7			3	1					2	2	4	12
8				1			1			1		3
9				1			1		1	1	1	5

B	To- tal	0	6	12	5	2	2	1	10	15	17	70
---	------------	---	---	----	---	---	---	---	----	----	----	----

Check







## X MULTIPLICATIONS RULE II

PAGE 25

GROUP	X	SET, 4										D
A	C	0	1	2	3	4	5	6	7	8	9	To- tal
	0											0
	1											0
	2	'		'						'		3
	3				" "					'		5
	4		'	" "		'				'		7
	5	"		'	'	"	'	"	'			10
	6		'	"	"	"	'	'	'	'		12
	7		"	"	"		'	"				13
	8		"	"	"	"	'	"	'			24
	9	"	"	"	"	"	"	"	"	'		28

B To-  
tal 6 16 16 23 12 13 11 8 2 0 102

A	C	0	1	2	3	4	5	6	7	8	9	To- tal
	0											0
	1											0
	2	1		1					1			3
	3				2 2				1			5
	4		1	2 2		1		1				7
	5	2		1 1	2	1	2	1				10
	6		1	2 3	2	1	1	1	1			12
	7		3	2 4		1	3					13
	8		6	3 6	4	1	3	1				24
	9	3	5	5 5	2	3	2	2	1			28

B To-  
tal 6 16 16 23 12 8 11 8 2 0 102

Check

A	C	0	1	2	3	4	5	6	7	8	9	To- tal
	0		1				2				3	6
	1					1		1	3	6	5	16
	2			1		2	1	2	2	3	5	16
	3				2 2	1	3	4	6	5	23	
	4				2		2	2		4	2	12
	5					1	1	1	1	1	3	8
	6						2	1	3	3	2	11
	7			1	1	1	1	1		1	2	8
	8							1			1	2
	9											0

B To-  
tal 0 0 3 5 7 10 12 13 24 28 102







		MULTIPLICATIONS										RULE II	
GROUP X		EXCEPTIONS 1										D	
A	C x	0	1	2	3	4	5	6	7	8	9	To- tal	
	0											0	
	1											0	
	2			/	'''	'''						8	
	3			'''				''				5	
	4						/	/	/			3	
	5				/	/		/	/			4	
	6				/				/	/		3	
	7			''	/					/	''	6	
	8				/	/				/	''	5	
	9			''	''	'''	/	'''	/	/		14	
B	To- tal	0	0	8	10	8	2	8	4	4	4	48	
C												D	
A	x	0	1	2	3	4	5	6	7	8	9	To- tal	
	0											0	
	1											0	
	2			1	4	3						8	
	3			3				2				5	
	4						1	1	1			3	
	5				1	1		1	1			4	
	6				1				1	1		6	
	7			2	1					1	2	5	
	8				1	1				1	2	5	
	9			2	2	3	1	4	1	1		14	
B	To- tal	0	0	8	10	8	2	8	4	4	4	48	
C												D	
Check	A	x	0	1	2	3	4	5	6	7	8	9	To- tal
		0											0
		1											0
		2			1	3				2		2	8
		3			4			1	1	1	1	2	10
		4			3			1			1	3	8
		5					1					1	2
		6				2	1	1				4	8
		7					1	1	1			1	4
		8							1	1	1	1	4
		9								2	2		4
B	To- tal	0	0	8	5	3	4	3	6	5	14	48	







## X MULTIPLICATIONS RULE II PAGE 28

GROUP X	C	0	1	2	3	4	5	6	7	8	9	D
A	x	0	1	2	3	4	5	6	7	8	9	To- tal
	0			'				'		'	'	4
	1		'		'							2
	2		'''	'	''							7
	3		'	''								3
	4											0
	5		'									1
	6		'''									5
	7		''		'							3
	8		''	''								4
	9		''	'	''							5

B To- tal	0	18	7	6	0	0	1	0	1	1	34
C											D

A	x	0	1	2	3	4	5	6	7	8	9	To- tal
	0			1				1		1	1	4
	1		1		1							2
	2		4	1	2							7
	3		1	2								3
	4											0
	5		1									1
	6		5									5
	7		2		1							3
	8		2	2								4
	9		2	1	2							5

B To- tal	0	18	7	6	0	0	1	0	1	1	34
C											D

Check

A	x	0	1	2	3	4	5	6	7	8	9	To- tal
	0											0
	1		1	4	1		1	5	2	2	2	18
	2	1		1	2					2	1	7
	3		1	2					1		2	6
	4											0
	5											0
	6	1										1
	7											0
	8	1										1
	9	1										1
B	To- tal	4	2	7	3	0	1	5	3	4	5	34















X

## MULTIPLICATIONS RULE II

PAGE 30

GROUP X			EXCEPTIONS 4 Set 1. D										
A	C	x	0	1	2	3	4	5	6	7	8	9	Total
0													5
1													0
2													10
3													2
4													1
5													2
6													5
7													2
8													7
9													2

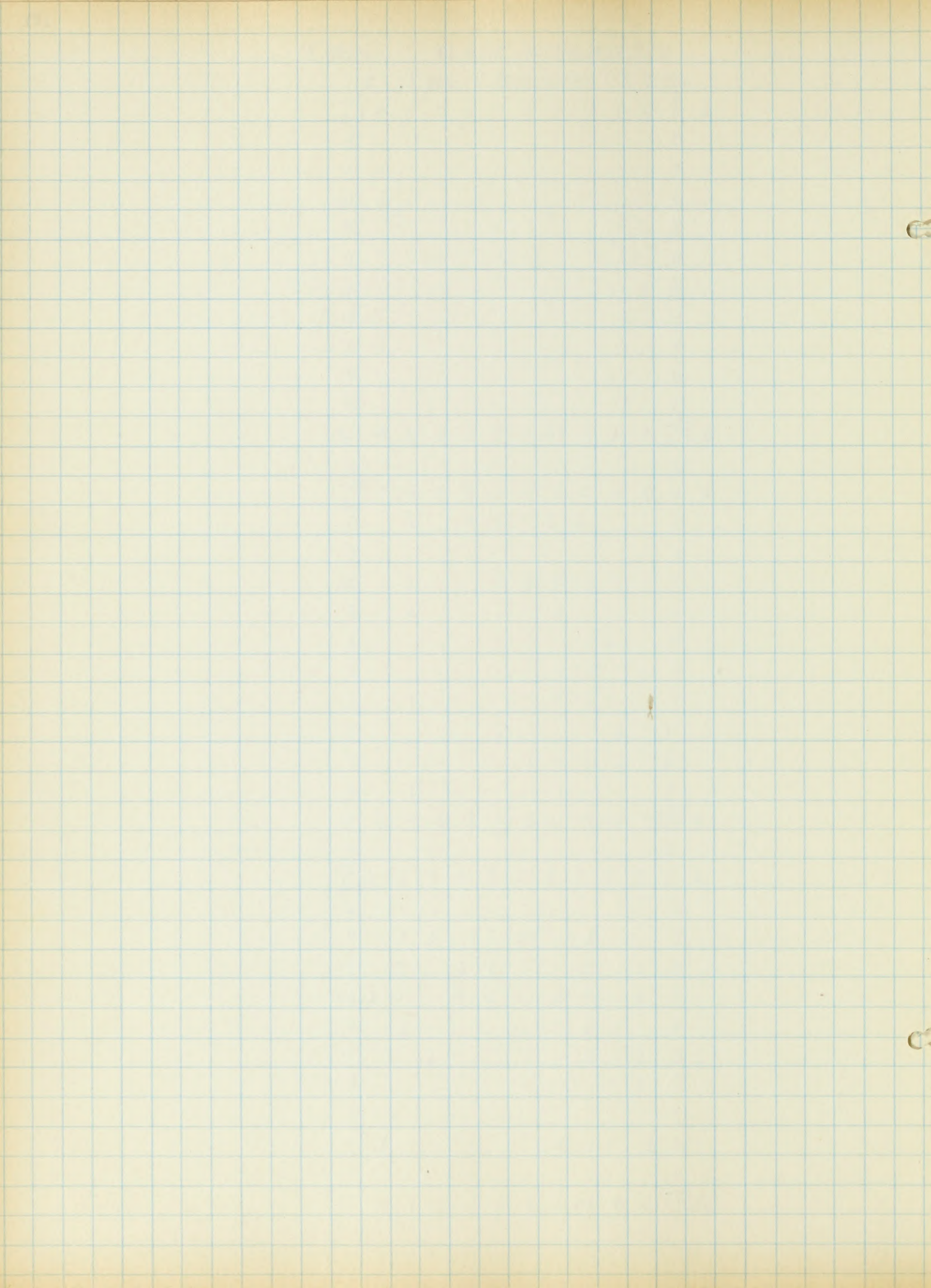
B	To- tal	0	4	7	14	2	3	1	0	5	0	36
---	------------	---	---	---	----	---	---	---	---	---	---	----

C											D	
A	x	0	1	2	3	4	5	6	7	8	9	Total
0				1	1		1	1		1		5
1												0
2			1	2	4	1	1			1		10
3					1					1		2
4			1									1
5				1	1							2
6				1	3					1		5
7			1				1					2
8			1	2	3	1						7
9					1					1		2

B	To- tal	0	4	7	14	2	3	1	0	5	0	36
---	------------	---	---	---	----	---	---	---	---	---	---	----

C												D
A	x	0	1	2	3	4	5	6	7	8	9	To- tal
0												0
1			1		1				1	1		4
2	1		2				1	1		2		7
3	1		4	1			1	3		3	1	14
4			1							1		2
5	1		1						1			3
6	1											1
7												0
8	1		1	1				1			1	5
9												0
To- Btal		5	0	10	2	1	2	5	2	7	2	36







## X MULTIPLICATIONS RULE II

PAGE 30

GROUP X										EXCEPTIONS 4				Set 2
A	C	x	0	1	2	3	4	5	6	7	8	9	Total	
	0												0	
	1												0	
	2			'	'		'		'		'	"	7	
	3				'	'		"	'				5	
	4												0	
	5				"	'		"	"			'	10	
	6				'			"	"				6	
	7			'		'		"	"				7	
	8				'		'				'	"	5	
	9			'			'		'		'	'	5	

Atal	To-	0	3	6	3	3	12	9	0	3	6	45
------	-----	---	---	---	---	---	----	---	---	---	---	----

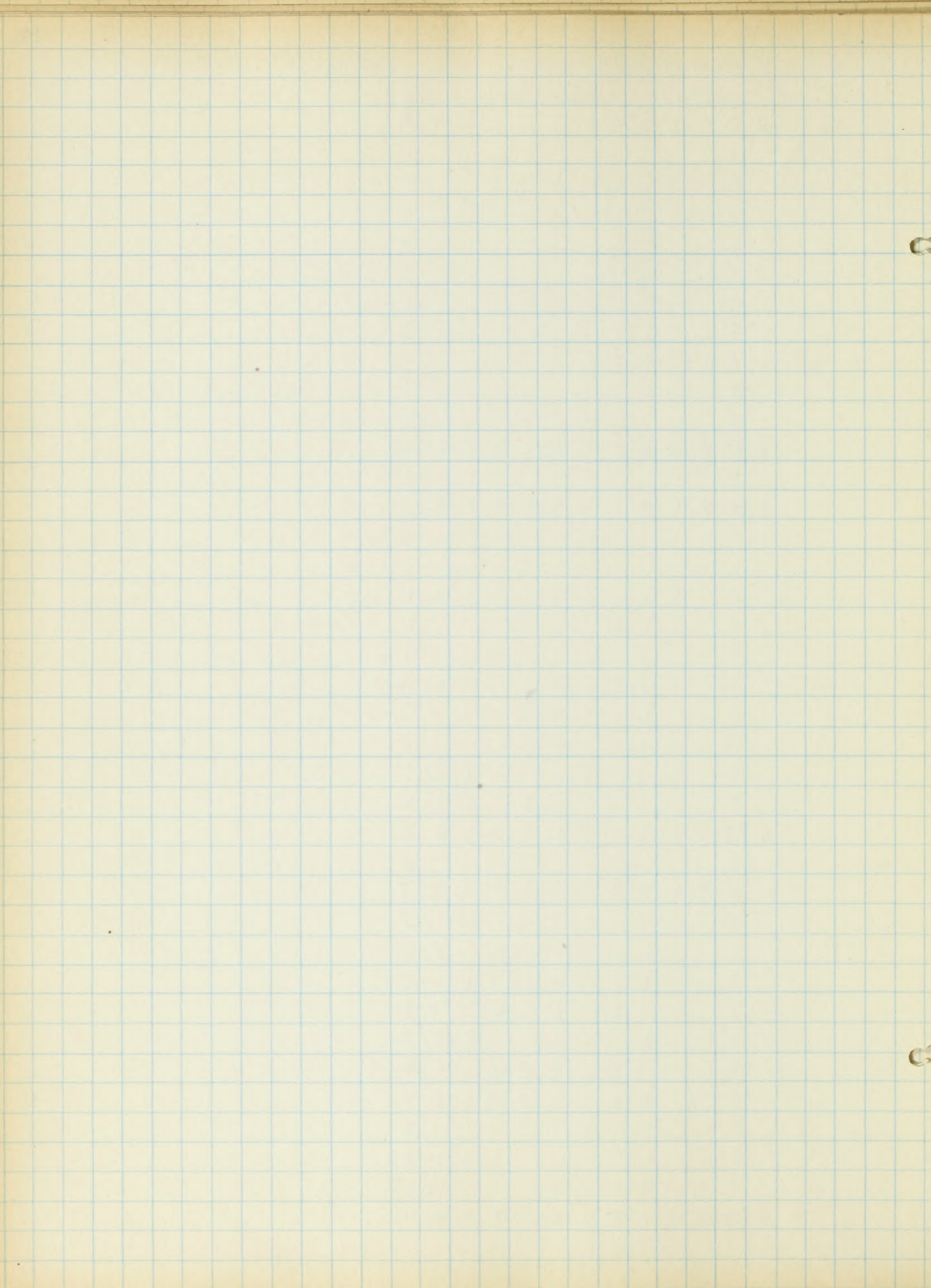
A	C	x	0	1	2	3	4	5	6	7	8	9	Total
	0												0
	1												0
	2		1	1		1		1		1	2		7
	3			1	1		2	1					5
	4												0
	5			2	1		4	2			1		10
	6			1			3	2					6
	7		1		1		3	2					7
	8			1		1				1	2		5
	9		1			1		1		1	1		5

B	To-	0	3	6	3	3	12	9	0	3	6	45
---	-----	---	---	---	---	---	----	---	---	---	---	----

A	C	x	0	1	2	3	4	5	6	7	8	9	Total
	0												0
	1			1						1		1	3
	2			1	1		2	1		1			6
	3				1		1		1				3
	4			1						1	1		3
	5				2		4	3	3				12
	6			1	1		2	2	2		1		9
	7												0
	8			1						1	1		3
	9			2			1			2	1		6

B	To-	0	0	7	5	0	10	6	7	5	5	45
---	-----	---	---	---	---	---	----	---	---	---	---	----







## X TOTALS - MULTIPLICATIONS

RULE II

PAGES 23-30

GROUP X		RULE II										D
A	C x	0	1	2	3	4	5	6	7	8	9	To- tal
	0			2	1		1	2		2	1	9
	1	3	8	13	20	9	10	19	19	8	9	118
	2	1	9	9	16	7	3	2	2	4	4	57
	3	1	7	7	9	8	6	5	4	2	4	53
	4	1	6	3	3	0	5	3	7	2	1	31
	5	3	3	5	10	6	9	8	5	5	2	56
	6	0	7	4	17	11	7	9	9	7		71
	7	1	15	15	11	9	8	11	7	1	6	84
	8	2	14	19	21	17	8	8	10	8	5	112
	9	4	19	13	18	7	5	9	10	9	2	96
B	To- tal	16	88	90	126	74	62	76	73	48	34	687

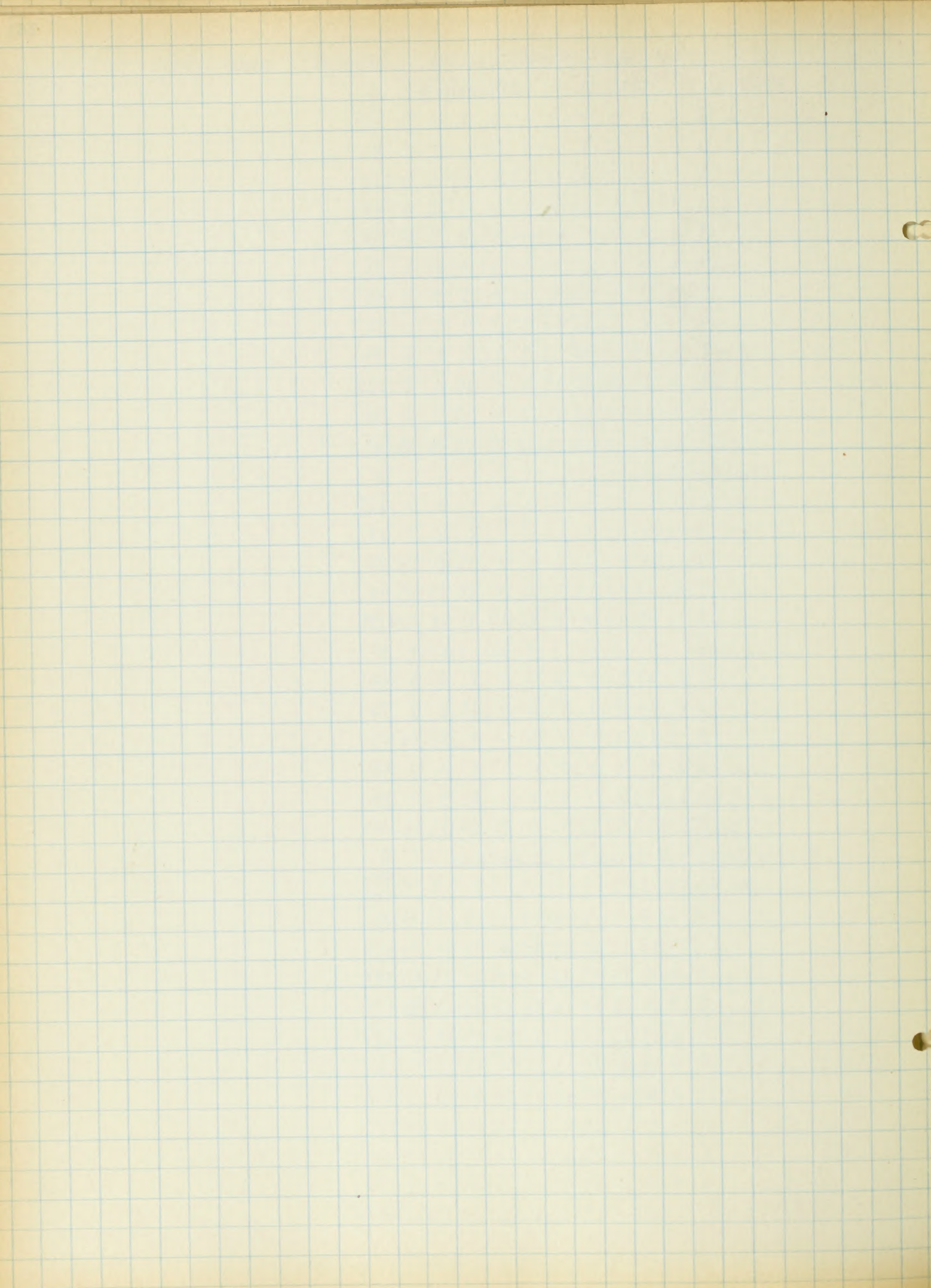
Totals - Check

A	C x	0	1	2	3	4	5	6	7	8	9	To- tal
	0		3	1	1	1	3		1	2	4	16
	1		8	9	7	6	3	7	15	14	19	88
	2	2	13	9	7	3	5	4	15	19	13	90
	3	1	20	16	9	3	10	17	11	21	18	126
	4		9	7	8		6	11	9	17	7	74
	5	1	10	3	6	5	9	7	8	8	5	62
	6	2	19	2	5	3	8	9	11	8	9	76
	7		19	2	4	7	5	9	7	10	10	73
	8	2	8	4	2	2	5	7	1	8	9	48
	9	1	9	4	4	1	2		6	5	2	34
B	To- tal	9	118	57	53	31	56	71	84	112	96	687

Totals Check and Group X - Exceptions

A	C x	0	1	2	3	4	5	6	7	8	9	To- tal
	0		3	3	2	1	4	2	1	4	5	25
	1	3	16	22	27	15	13	26	34	22	28	206
	2	3	22	18	23	10	8	6	17	23	17	147
	3	2	27	23	18	11	16	22	15	23	22	179
	4	1	15	10	11		11	14	16	19	8	105
	5	4	13	8	16	11	18	15	13	13	7	118
	6	2	26	6	22	14	15	18	20	15	9	147
	7	1	34	17	15	16	13	20	14	11	16	157
	8	4	22	23	23	19	13	15	11	16	14	160
	9	5	28	17	22	8	7	9	16	14	4	130
B	To- tal	25	261	147	179	105	118	147	157	160	130	1374







## TOTALS MULTIPLICATIONS

## TOTALS RULE I

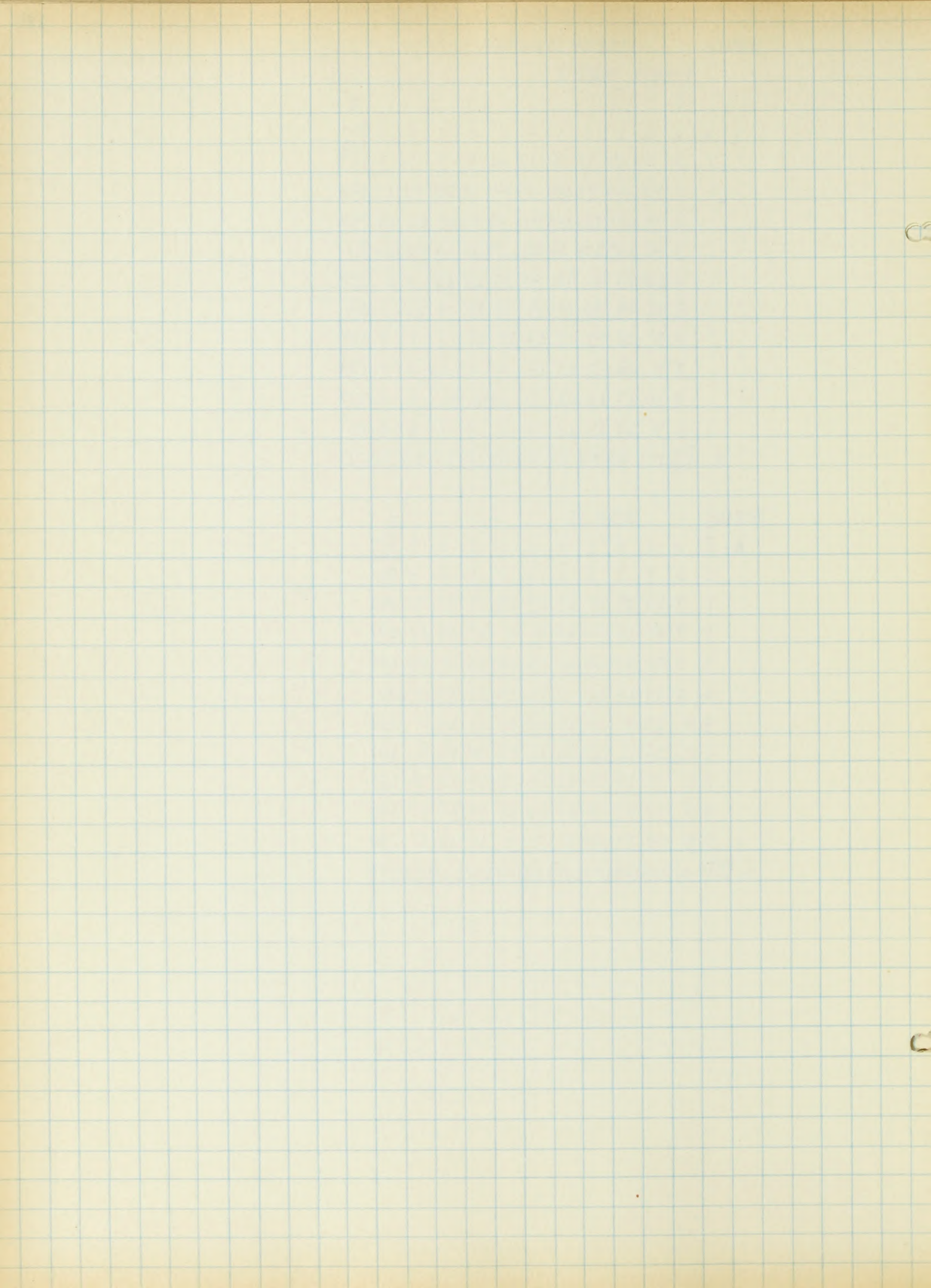
		C										D	
A	x	0	1	2	3	4	5	6	7	8	9	To-	tal
	0	8	50	37	22	18	11	5	9	10	3	173	
	1	50	264	275	159	69	44	29	26	19	13	948	
	2	37	275	168	123	44	30	25	23	18	14	757	
	3	22	159	123	54	42	33	22	18	22	12	507	
	4	18	69	44	42	28	25	15	14	9	8	272	
	5	11	44	30	33	25	28	18	4	11	6	210	
	6	5	29	25	22	15	18	10	9	7	3	143	
	7	9	26	23	18	14	4	9	10	3	7	123	
	8	10	19	18	22	9	11	7	3	2	6	107	
	9	3	13	14	12	8	6	3	7	6	0	72	
B	To-	tal	173	948	757	507	272	210	143	123	107	72	312

## TOTALS

## RULE II

		C										D	
A	x	0	1	2	3	4	5	6	7	8	9	To-	tal
	0	0	3	3	2	1	4	2	1	4	5	25	
	1	3	16	22	27	15	13	26	34	22	28	206	
	2	3	22	18	23	10	8	6	17	23	17	147	
	3	2	27	23	18	11	16	22	15	23	23	179	
	4	1	15	10	11	0	11	14	16	19	8	105	
	5	4	13	8	16	11	18	15	13	13	7	118	
	6	2	26	6	22	14	15	18	20	15	9	147	
	7	1	34	17	15	16	13	20	14	11	16	157	
	8	4	22	23	23	19	13	15	11	16	14	160	
	9	5	28	17	22	8	7	9	16	14	4	130	
B	To-	tal	25	206	147	179	105	118	147	160	130	1374	















SPECIFIC NOTING OF THE

LONG DIVISION TASK

AND

WORK DONE WITH

INDIVIDUALS OF CLASS

DISTRIBUTED TO SHOW MASTERY

SUMMARY





## P L A N

The children, after seeing the results of their Long Division Tests decided that they would be willing to try and improve in Long Division.

In order to do this the pupils realized that it was necessary for them to be efficient in the fundamental facts of subtraction and multiplication. This would demand a very great amount of practice drill on the part of some students, and for others very little.

The children took "100% Efficiency" for their aim, and their one motive was to be 100% efficient in the fundamentals of arithmetic, realizing that the control of number processes and the mastery of public school arithmetic were in accord with the demands of life, and were the necessary tools for the 100% efficient adult.

How are we to become efficient? What is necessary for us to do to become 100% efficient? The classes talked these questions over and finally came to these conclusions.

1. Every child must at all times do his very best work, and he must work very carefully, accurately and as quickly as possible.
2. Every child must check all work. Any example not checked was counted a failure.
3. Every child must keep his own record sheet (See Individual's 100% Efficiency Sheet) on which each day, immediately at the completion of the exercise, he recorded his errors or 100%. This record sheet and drill arithmetic paper must be given to the teacher to be verified and checked.
4. Every child, who failed to receive 100% in any group or set of a group of examples, must do it over until 100% efficiency is reached. If he failed twice on the same test the teacher must give him immediate individual attention. The corrected group must be registered on the individual record.
5. Every child who failed to receive 100% must be considered a failure in that group until it has been corrected.
6. No child, who failed on three groups and had not corrected them, would be allowed to go on with their class.





7. Absent children were failures until they had made up the groups which they had missed.

8. Every child must use at least five minutes of the gong work period a day for individual remedial study. This might be done alone or by one individual being helped by a superior child. A superior child was a pupil who was 100% efficient in that group.

9. The teacher must keep a class record sheet (See Teacher's Class Record)

10. At all times the pupils must work for 100% efficiency.

At first the members of the class did not care to use the word "failure". It was finally decided that it was the best word to use, as no child desired to be called by such a name, and it would spur each one on to do his best work.

These rulings were adopted by the children of the three classes, namely, Grade V<sup>1</sup>, V<sup>2</sup>, and VI, the teacher and the principal.

Record sheets were made by both the pupils and the teacher (See Teacher's Class Record's Sheet and Individual 100% Efficiency Sheet.) These were kept daily by each individual, who used them for practice-drill and by the teacher, who based her next day's teaching upon it. She was thus able to give her attention to the children who needed it them most.

The three grades were departmentalized so that there was one arithmetic teacher who was just as enthused for 100% efficiency as was the children and the principal.

On the morning of October 24, 1928 hectograph papers containing the examples of Group I, set 1, page 6, of the Wilson Work Book and Drill Service in Long Division were passed to the children in the class. Two teams were formed, the left side of the room with the Teacher as Captain, and the right side with the Principal as Captain.

At the word "Go", each child said, "100% efficiency go" and the race was on.

The Captains sat in the rear of the room on their respective sides, at one of the children's desks. Here the papers of each child were corrected.





After the children had been working four minutes, two children in the first and second seat at the extreme front end of the room brought their papers to their Captain, who corrected the examples completed of the first child. He returned to his seat and worked on the remaining examples. Pupil three went to the Captain who was now correcting pupil number two's examples. An example to be completed must be checked. This method of doing and checking the examples and correcting them in rotation was continued until the end of the period, which lasted from ten to twenty minutes, according to the difficulty of the examples.

If one side finished the set first, they called "Stop". At this all pupils stopped work. Those who had not completed the work did so during the gong work period or after school, and received credit for it. These drills were not time drills. Each child was supposed to work just as fast as he was able, accurately.

After completing each group of work the students recorded on their record sheets the group number, and after that a 100 was placed if all the examples were correct, but if there were any errors, the incorrect examples were placed after the group number (See Individual's 100% Efficiency Sheet). It was the duty of each individual to correct all errors as soon as possible.

The 100% efficient people stood and were counted. The side having the largest number of 100% efficient children won for the day. The score was placed on the board and the winning side received a clap of satisfaction. At the end of each week the total score was found.

The Captains kept a record sheet of the daily work of each pupil in the room and she checked off the corrected work as faithfully as she did the class work. This sheet was mounted and placed in a conspicuous spot in the room where the children could compare their results. Incidentally, the spirit of competition grew up and acted as a spur for better work.

This record sheet enabled the teacher to see at a glance:





1. The weaknesses of her class.
2. What phases of the work needed immediate class or individual attention.
3. Those pupils who were in urgent need of remedial attention.

The second week the children desired to have two managers who were to pick the sides. Each class chose a name for its team. Grade V<sup>1</sup> teams were Harvard and Yale; Grade V<sup>2</sup> Dartmouth and Boston University; and Grade VI Annapolis and West Point.

At the end of the arithmetic period two managers were elected by the children. Before school the next morning the managers picked the players and gave their names to the Captain.

It was the duty of the managers to have 100% efficient teams, and if the manager had chosen any one who failed in the drill, it was his job to see that these failures got remedial instruction so as to bring them up to 100% efficiency.

The 100% players were called the superior children and they were allowed to give remedial aid, during gong period, drill period or after school.

The teacher realized that some children who failed frequently needed encouragement, therefore she always tried to give some help while she was correcting the papers, if it was found necessary. Any error which was made twice in the same group was brought to the child's attention, who immediately, on returning to his seat, corrected it. The members of the class knew that the child being helped had failed and needed attention at that moment, in order to put him on the road to 100% efficiency.

When the teacher saw that the interest of the class was beginning to wane, she would not have the managers choose the teams. Instead, on Monday morning, after giving out drill paper, the windows were opened and the children, with their pencil and paper in hand formed a line. At the order of "double quick", the children marched around the room until the command "Stop" was given. Each child had the privilege of sitting on whichever side he desired. This encouraged the pupil who was always a last choice, and it also recreated their interest and aroused their spirit to do better work.

Another way that children enjoyed forming the teams was: Each boy and girl

1. The first of these is the fact that the

the second of these is the fact that the

the third of these is the fact that the

the fourth of these is the fact that the

the fifth of these is the fact that the

the sixth of these is the fact that the

the seventh of these is the fact that the

the eighth of these is the fact that the

the ninth of these is the fact that the

the tenth of these is the fact that the

the eleventh of these is the fact that the

the twelfth of these is the fact that the

the thirteenth of these is the fact that the

the fourteenth of these is the fact that the

the fifteenth of these is the fact that the

the sixteenth of these is the fact that the

the seventeenth of these is the fact that the

the eighteenth of these is the fact that the

the nineteenth of these is the fact that the

the twentieth of these is the fact that the

the twenty-first of these is the fact that the

the twenty-second of these is the fact that the

the twenty-third of these is the fact that the

the twenty-fourth of these is the fact that the

the twenty-fifth of these is the fact that the

the twenty-sixth of these is the fact that the

the twenty-seventh of these is the fact that the

the twenty-eighth of these is the fact that the

the twenty-ninth of these is the fact that the

the thirtieth of these is the fact that the

the thirty-first of these is the fact that the



put his head on the desk. The Captain touched the heads of the managers, who, in turn, touched alternately the heads of their players. On signal the children changed to their team seats. The formations of teams should be varied in order to keep the children working up to the limit of their ability.

The same plan was carried on in each class. That is: first the doing of the examples from a hectographed sheet or from the blackboard; and the checking of same.

2. Each child checking up the sources of error and noting them as carefully as possible.

3. Correcting all errors and recording the results.

4. Five-minute practice-drill period on the fundamental facts of subtraction and multiplication given daily preceding the Long Division drill Exercise.

5. Careful and thoughtful teaching done on a helping basis with a thoroughly interested and motivated child.

These drills were not time exercises, although a time allotment was given so as to keep the children working up to a reasonable standard for the grade.





Robert Pelton Oct. 1, 1928  
My Errors in Test.

4A - Oct. 1, 1928

$$\begin{array}{r} \frac{6}{8} - \frac{5}{8} - \frac{9}{8} - \frac{2}{8} - \frac{1}{8} - \frac{6}{4} \\ \hline \end{array}$$

4B - Oct. 3, 1928

$$\begin{array}{r} 13 \\ - 6 \\ \hline 7 \end{array}$$

4C - Oct. 3, 1928

$$16 - 9 = 7$$

5A - Oct. 5, 1928

6A - Oct. 8, 1928

$$9 \overline{) 54}$$

6B<sup>1</sup> - Oct. 9, 1928

$$\begin{array}{ccccccc} \begin{array}{r} 0-2R \\ 4 \overline{) 2} \end{array} & \begin{array}{r} 0-1R \\ 7 \overline{) 1} \end{array} & \begin{array}{r} 0-2R \\ 8 \overline{) 2} \end{array} & \begin{array}{r} 0-2R \\ 9 \overline{) 2} \end{array} & \begin{array}{r} 0-4R \\ 6 \overline{) 4} \end{array} & \begin{array}{r} 0-3R \\ 7 \overline{) 3} \end{array} & \\ \begin{array}{r} 0-3R \\ 8 \overline{) 3} \end{array} & \begin{array}{r} 0-1R \\ 3 \overline{) 1} \end{array} & \begin{array}{r} 0-4R \\ 9 \overline{) 7} \end{array} & \begin{array}{r} 0-5R \\ 7 \overline{) 5} \end{array} & \begin{array}{r} 0-2R \\ 3 \overline{) 2} \end{array} & \begin{array}{r} 1-2R \\ 3 \overline{) 5} \end{array} & \end{array}$$

6B<sup>2</sup> - Oct. 10, 1928

$$\begin{array}{ccccccc} \begin{array}{r} 0-5R \\ 8 \overline{) 5} \end{array} & \begin{array}{r} 0-1R \\ 9 \overline{) 1} \end{array} & \begin{array}{r} 0-3R \\ 9 \overline{) 3} \end{array} & \begin{array}{r} 0-1R \\ 6 \overline{) 1} \end{array} & \begin{array}{r} 0-2R \\ 7 \overline{) 2} \end{array} & \begin{array}{r} 0-4R \\ 9 \overline{) 4} \end{array} & \begin{array}{r} 0-3R \\ 4 \overline{) 3} \end{array} \\ \begin{array}{r} 1-1R \\ 5 \overline{) 1} \end{array} & \begin{array}{r} 0 \\ 9 \overline{) 0} \end{array} & \begin{array}{r} 0 \\ 5 \overline{) 0} \end{array} & \begin{array}{r} 0-2R \\ 3 \overline{) 2} \end{array} & \begin{array}{r} 0-6R \\ 9 \overline{) 6} \end{array} & \begin{array}{r} 0 \\ 2 \overline{) 0} \end{array} & \begin{array}{r} 1-1R \\ 3 \overline{) 4} \end{array} \end{array}$$





Helen Boutin

Oct. 1, 1928

My Errors in Test.

4A - Oct. 1, 1928

$$\begin{array}{r} -6 \\ 6 \end{array}$$

4B - Oct. 2, 1928 —

4C - Oct. 3, 1928

$$86-81=5, 89-81=8, 39-32=7, 70-64=6, 16-14=2,$$

5A - Oct. 5, 1928

$$\begin{array}{r} 8 \quad 8 \quad 5 \\ - \frac{2}{8} - \frac{3}{5} - \frac{0}{5} \end{array}$$

6A - Oct. 8, 1928

$$\begin{array}{r} 7 \\ 9 \overline{) 63} \end{array} \quad \begin{array}{r} 7 \\ 6 \overline{) 42} \end{array}$$

6B.1 Oct. 9, 1928

$$\begin{array}{cccccccc} \begin{array}{r} 7-4R \\ 6 \overline{) 46} \end{array} & \begin{array}{r} 8-3R \\ 6 \overline{) 51} \end{array} & \begin{array}{r} 7-3R \\ 6 \overline{) 45} \end{array} & \begin{array}{r} 0-4R \\ 8 \overline{) 4} \end{array} & \begin{array}{r} 0-5R \\ 6 \overline{) 5} \end{array} & \begin{array}{r} 0-4R \\ 7 \overline{) 4} \end{array} & \begin{array}{r} 0-2R \\ 4 \overline{) 2} \end{array} & \begin{array}{r} 7-5R \\ 6 \overline{) 47} \end{array} \\ \begin{array}{r} 0-2R \\ 8 \overline{) 2} \end{array} & \begin{array}{r} 5-8R \\ 9 \overline{) 53} \end{array} & \begin{array}{r} 2-6R \\ 8 \overline{) 22} \end{array} & \begin{array}{r} 0-2R \\ 9 \overline{) 2} \end{array} & \begin{array}{r} 8-3R \\ 8 \overline{) 27} \end{array} & \begin{array}{r} 0-4R \\ 6 \overline{) 4} \end{array} & \begin{array}{r} 0-3R \\ 7 \overline{) 3} \end{array} & \begin{array}{r} 0-3R \\ 8 \overline{) 3} \end{array} \\ \begin{array}{r} 0-1R \\ 3 \overline{) 1} \end{array} & \begin{array}{r} 0-7R \\ 9 \overline{) 7} \end{array} & \begin{array}{r} 0-5R \\ 7 \overline{) 5} \end{array} & \begin{array}{r} 1-2R \\ 3 \overline{) 5} \end{array} & \begin{array}{r} 0-3R \\ 6 \overline{) 3} \end{array} & & & \end{array}$$

6B.2 - Oct. 10, 1928

$$\begin{array}{ccccccc} \begin{array}{r} 0 \\ 5 \overline{) 0} \end{array} & \begin{array}{r} 0 \\ 9 \overline{) 0} \end{array} & \begin{array}{r} 8-6R \\ 9 \overline{) 78} \end{array} & \begin{array}{r} 6-6R \\ 9 \overline{) 60} \end{array} & \begin{array}{r} 0 \\ 4 \overline{) 0} \end{array} & \begin{array}{r} 0 \\ 2 \overline{) 0} \end{array} & \begin{array}{r} 2-5R \\ 6 \overline{) 17} \end{array} \end{array}$$





DISTRIBUTION CHARTS

TO SHOW PROGRESSION

TOWARDS 100% EFFICIENCY

GRADE V

TEACHERS RECORDS

PUPIL'S INDIVIDUAL RECORD

SUMMARY

GRADE VI

TEACHERS RECORDS

PUPIL'S INDIVIDUAL RECORD

SUMMARY





The Work Book and Drill Service in Long Division by G. M. Wilson contained four hundred eighty-seven examples, which were graded according to their difficulties, into ten groups, classed under two rules.

Rule I consisted of Group 1-9 and exceptions, which was made up of 320 drills examples, while

Rule II consisted of Group X and exceptions, which was made up of 167 examples.

Any group which was made up of more than ten examples, or if in the judgment of the teacher the children would not be able to complete the group in the allotted time, was divided into 2 or 3 sets of 6, 8, or 10 examples each. The 10 groups and exceptions were divided into 51 sets.

One set or group of examples were given each day for 51 days, or until every example of the ten groups was completed. This was accomplished January 15, 1929. The Penalty Score was the basis of all work.

The class decided that they would like to retake the work and see if they really improved. So, from January 21, 1929 to March 18, 1929, the Wilson's Work Book and Drill Service was given a second trial. From March 1, 1929 to March 18, 1929 two sets of examples were given daily, one in the morning and one in the afternoon.

The children made their individual graphs to see their progression towards 100% efficiency, and the teacher graphed the progression of the class. (See Charts No. 28 and 31).

A child who was 100% efficient on the first trial in any group was not obliged to retake the group unless he desired to do so for practice drill.

The same plan was followed as in the first trial except that those who were 100% efficiency and retook the tests were given an opportunity to work along through the drill service until they failed. A failure was obliged to do the whole group over.

Many of the children took advantage of this opportunity and were keenly interested in remaining 100% efficient.





The time limit was the same, but many completed the work in a shorter period of time.

Progression towards 100% efficiency may be readily seen by studying the Charts No. 29-133)

The work in Group I was made up of 110 very simple examples in Long Division. Each member of the classes followed the simple plan of six steps in doing Long Division. The six steps are:

1. Divide. 2. Multiply and compare. 3. Subtract and compare. 4. Bring down and compare. 5. The remainder noted by marking it with R. 6. Checking the answer.

This first group was divided into 10 smaller groups which contained 10 to 20 examples in each group, and gave a great opportunity for the children to master the Long Division Plan.

Group I involved divisors of two places and its right hand figure very small. No carrying in multiplication, no borrowing in subtraction, and no remainders. In this group Grade V, 70 pupils obtained a Median of 100 and a Mean of 82.1% on first trial, but on second trial they received a Median of 100, and a Mean of 99.7%, showing a progression of 17.6% towards 100% Efficiency in three months. (See Charts No. 29-38)

Grade VI, 36 pupils, obtained a Median of 100 and a Mean of 92.9% on first trial, but on second trial the Median was 100 and the Mean was 100%. This showed a progression of 7.1% towards 100% Efficiency. (See Chart 82-91).

Group II was made up of 110 examples which was divided into 10 smaller groups. These examples involved two place divisors, three or four place dividends, with a remainder, but there was no borrowing or carrying. The General plan including checking was followed. Rule I "When a two figure divisor ends in 1, 2, 3, 4, or 5 use the first figure of the divisor as a trial divisor" was learned and tried out. Although there were a few exceptions to the Rule, it proved a great help, which showed up greatly in the speed and accuracy on the second trial.

In this group Grade V, 70 pupils obtained a Median of 100 on both trials. The Mean on the first trial was 84.1% and 98.7% on the second trial. This was a





progression of 14.6% towards 100% efficiency in the Mean (See Charts No. 39-48)

Grade VI, 36 pupils, obtained a Median of 100 in the first and second trial. On the first trial the Mean was 90.2% and 99.4% on the second trial, showing a progression toward 100% Efficiency in the Mean of 9.2% (See Charts No. 92-101)

Group III was made up of 35 examples, the first partial dividend required one more digit than the divisor contained. The general plan including checking was followed. The second trial showed that the children became very familiar with this new feature.

In this group Grade V, 70 pupils, received a Median of 100 on both trials, but a Mean of 62.8% on first trial and 97.1% on the second trial, thus showing a progression of 34.3% towards 100% efficiency in the Mean (See Chart No. 49)

Grade VI, 36 pupils, received a Median of 100 on both trials, but a Mean of 83.3% on the first trial and 94.4% on the second trial. This showed a progression towards 100% efficiency of 11.1% in the Mean (See Chart No. 102)

Group IV was made up of 24 examples in which the right hand figure of the divisor was the larger. These examples involved carrying in Multiplication, while in the previous groups I, II, III, there was no carrying in multiplication.

In this Group Grade V, 70 pupils, obtained a Median of 100 on both trials and a Mean of 62.8% on the first trial and 95.7% on the second trial, showing a progression toward 100% efficiency in the Mean of 32.9% (See Chart No. 50)

Grade VI, 36 pupils, obtained a Median of 100 on both trials but a Mean of 75% on first trial and 91.6% on second trial, showing a progression of 16.6% in the Mean towards 100% Efficiency. (See Chart No. 103)

Group V was made up of 21 examples which required borrowing in subtraction, but no carrying in Multiplication.

In this group Grade V, 70 pupils had a Median of 100 on both trials and a Mean of 78.5% on first trial and 93.5% on second trial, showing a progression toward 100% efficiency of 15.0% in the Mean (See Chart No. 51-2)

In this Group Grade VI, 36 pupils obtained a Median of 100 on both trials





and a Mean of 73.5% on first trial and 97.2% on second trial, showing a progression toward 100% Efficiency of 23.7% in the Mean. (See Charts No. 104-105).

Group VI was made up of 24 examples which involved both carrying in Multiplication and borrowing in Subtraction.

In this group Grade V, 70 pupils obtained a Median of 0 on first trial and 100 on second trial. On the first trial a Mean of 52.5% and 90.4% on the second trial, showing a progression towards 100% efficiency of 37.9% in the Mean and 100 in the Median. Most of the errors in this group were made in the subtraction where borrowing was involved. (See Charts No. 53, 54, 55)

Grade VI, 36 pupils, obtained a Median of 100 on both trials but a Mean of 81.4% on the first trial and 97.2% on the second trial, showing a progression towards 100% Efficiency of 15.8% in the Mean. (See Charts No. 106, 107, 108)

Group VII was made up of 28 examples which had more than two figures in the divisor.

In this group Grade V, 70 pupils had a Median of 100 on both trials, but a Mean of 63.2% on the first trial and 92.3% on the second, showing a progression towards 100% Efficiency in the Mean of 29.1% (See Charts No. 56, 57, 58)

Grade VI, 36 pupils had a median of 100 on both trials but a Mean of 73.1% on the first trial and 97.2% on the second trial, showing a progression towards 100% Efficiency in the Mean of 24.1%

Group VIII was made up of 20 examples which involved dividends containing zeros in unit's or ten's place, or both.

In this group Grade V, 70 pupils had a Median of 100 on both trials, but a Mean of 69.9% on first trial and 95.2% on second trial, showing a progression towards 100% Efficiency in the Mean of 25.3%. (See Charts No. 59, 60, 61.)

Grade VI, 36 pupils, had a Median of 100 on both trials, but a Mean of 61.1% on the first trial and 97.7% on the second trial, showing a progression towards 100% Efficiency in the Mean of 36.6% (See Charts No. 112, 113, 114).





Group IX was made up of 22 examples with zeros in the quotient. The child realized in this drill the necessity of placing a figure in the quotient every time that they brought a figure down from the dividend.

In this group Grade V, 70 pupils had a Median of 100 on both trials but a Mean of 62.9% on the first trial and 93.7% on the second trial, showing a progression towards 100% Efficiency of 30.8% (See Charts No. 62, 63, 64).

Grade VI, 36 pupils, had a Median of 100, on both trials, but a Mean of 75.8% on first trial and 100% on second trial, showing a progression towards 100% efficiency of 24.2%. (See Charts No. 115, 116, 117).

Exceptions to Rule I was made up of 26 examples which showed that Rule I could not always be followed as it sometimes failed to give the correct trial quotient.

In this group Grade V. 70 pupils, had a Median of 100 on both trials, but a Mean of 68.5% on the first trial and 97.8% on the second trial, showing a progression towards 100% efficiency in the Mean of 29.3%. (See Charts, No. 65, 66)

Grade VI, 36 pupils, had a Median of 100 on both trials but a Mean of 83.3% on the first trial and 100% on the second trial, showing a progression towards 100% Efficiency in the Mean of 16.7% (See Charts No. 118, 119).

The day before taking Group X the teacher used the Arithmetic period to teach Rule II which was a new method of finding a trial divisor. Each child learned this rule, "When a two figure divisor ends in 6, 7, 8, or 9, use the first figure increased by 1 as the trial divisor."

Rule II Group V was made up of 73 examples which involved borrowing in Subtraction and carrying in Multiplication. The children learned that at all times it was best to compare after they multiplied and subtracted.

In this group Grade V, 70 pupils had a Median of 0 on the first trial and 100% on the second trial. The Mean on the first trial was 63.1% and 93.1% on the second trial, showing a progression towards 100% Efficiency of 30.0% in the Mean. (See Charts No. 67-73)





Grade VI 36 pupils had a Median of 100 on both trials but a Mean of 76.5% on the first trial and 100% on the second trial, showing a progression toward 100% efficiency in the Mean of 23.5% (See Charts No. 120-126)

Exceptions to Rule II was made up of 94 examples which were divided into four sets of exercises. Exception No. 1 showed that if the remainders were larger than, or equal to, the divisor, we must make the trial quotient 1 larger.

Exception No. 2 helped the children to place greater reliance on the six step plan in long division and also gave them drill on seeing the answer at a glance or by inspection.

Exception No. 3 and No. 4 showed that Rule II did not always apply, and that the child must use the general plan, being careful to prove by checking and always to compare the remainder of every step with divisor before going on.

On the Exceptions of Rule II, Grade V, 70 pupils obtained Median of 100 on Exceptions No. 1, 2, 3 but a 0 on No. 4 on the first trial, but on the second trial they received a Median of 100 on all the Exceptions. The Mean on the Exceptions to Rule II on the first trial was 72.1% and 97.6% on the second trial, showing a progression toward 100% Efficiency in the Mean of 25.5% and the Median was 100. (See Charts 74.79)

Grade VI 36 pupils had a Median of 100 on the Exceptions of Rule II on both trials, but the Mean was 84.2% on the first trial and 100% on the second trial, showing a progression towards 100% Efficiency in the Mean of 15.8%. (See Charts No. 127-132)

Grade VI maintained a median of 100% efficiency in both trials but one can readily see that the decrease in number of errors, pupil failures, and the raising of the class Mean showed that the time was very well spent. (See Table No. )

In Grade V the class Median dropped below 100% in Group VI which contained exercises involving both carrying in multiplication and borrowing in subtraction, and in Group X and in the exceptions of Rule II. In all cases that phase of the work on which the pupils failed was given immediate attention and by looking at





the tables it can be seen that the children made a great leap towards 100% efficiency. This showed that remedial work worth doing should be properly localized on the precise skills and knowledges that have been shown to need it.

Charts 80 and 133 show at a glance the daily progression toward 100% Efficiency in Grade V and Grade VI on the first and second trial of the Work Book and Drill Service in Long Division.

The Children, after completing Work Book and Drill Service in Long Division realized that they had clearly in mind three workable points, which they were capable of using in Long Division, namely.

1. Rule I. "When a two figure divisor ends in 1, 2, 3, 4, or 5 use the first figure of the divisor as the trial divisor."

2. Rule II. "When a two figure divisor ends in 6, 7, 8, or 9 use the first figure of the divisor increased by 1 as the trial divisor."

3. When a rule failed, to fall back to the general plan of six steps, which included careful comparisons and study of each step.

The Work Book and Drill Service in Long Division afforded the children a great deal of opportunity for review in Multiplication and Subtraction. The work was so arranged that the various difficulties were separated, so that the children, who had troubles, could master them one at a time.





TAB. NO. XVII

TEMPERATURE RECORD

G R A D E V

TEMP. 100.0

DATE 1 - 10 1904





Pupils who failed to get 100%







INDIVIDUAL'S EFFICIENCY

RECORD AND CHART

TABLE XVIII



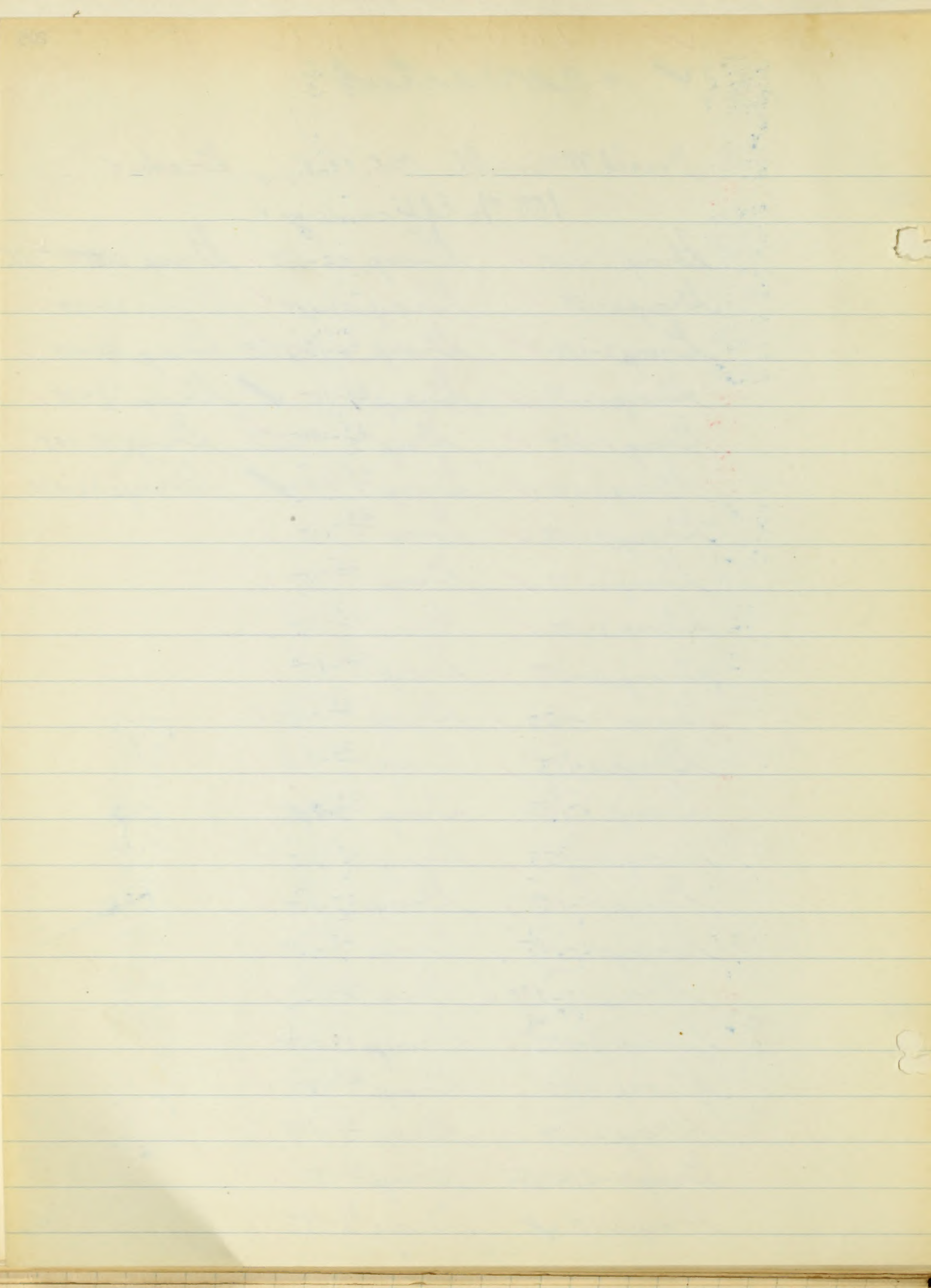


✓ = 100% efficiency  
 ✓ = corrected

Ronald McConnell Oct. 1928, Grade 5

100% Efficiency

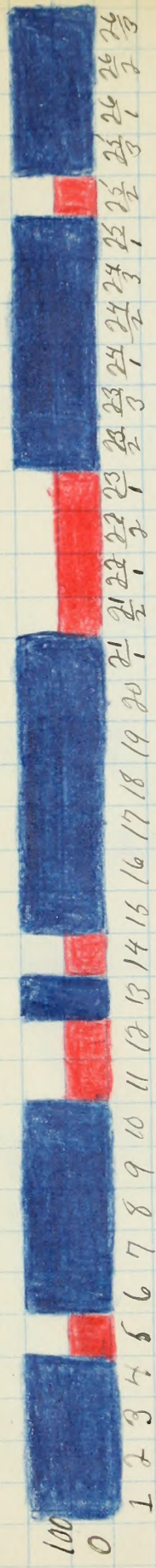
Group 1-100 ✓	Group 22-100 ✓	Group 32-100 ✓
Group 2-100 ✓	Group 23-100 ✓	Group 33-100 ✓
Group 3-100 ✓	Group $\frac{24}{7}$ -131/29955 ✓	Group $\frac{24}{7}$ -100 ✓
Group 4-100 ✓	Group $\frac{24}{7}$ -100 ✓	Group $\frac{24}{2}$ -100 ✓
Group 5-100 ✓	Group $\frac{24}{2}$ -247/82640 ✓	Group 35-100 ✓
Group 6-100 ✓	Group $\frac{24}{2}$ -100 ✓	Group 36-100 ✓
Group 7-100 ✓	Group $\frac{24}{3}$ -100 ✓	
Group 8-100 ✓	Group $\frac{25}{7}$ -100 ✓	
Group 9-100 ✓	Group $\frac{25}{2}$ -100 ✓	
Group 10-100 ✓	Group $\frac{25}{3}$ -100 ✓	
Group 11-100 ✓	Group $\frac{26}{7}$ -100 ✓	
Group 12-100 ✓	Group $\frac{26}{2}$ -100 ✓	
Group 13-100 ✓	Group $\frac{26}{3}$ -100 ✓	
Group 14-100 ✓	Group $\frac{27}{7}$ -100 ✓	
Group 15-100 ✓	Group $\frac{27}{2}$ -100 ✓	
Group 16-100 ✓	Group $\frac{28}{7}$ -100 ✓	
Group 17-100 ✓	Group $\frac{28}{2}$ -100 ✓	
Group 18-100 ✓	Group 29-100 ✓	
Group 19-100 ✓	Group $\frac{30}{7}$ -100 ✓	
Group 20-100 ✓	Group $\frac{30}{2}$ -100 ✓	
Group 21-51/41297 ✓	Group $\frac{31}{7}$ -100 ✓	
Group 21-100 ✓	Group $\frac{31}{2}$ -100 ✓	



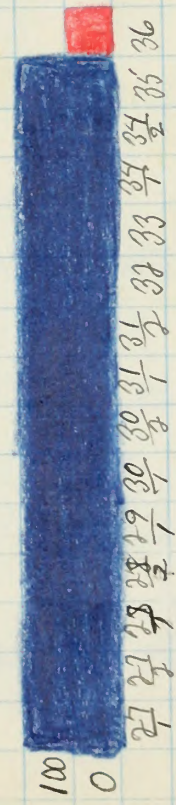


# Graphs - To Show Progression in Long Division

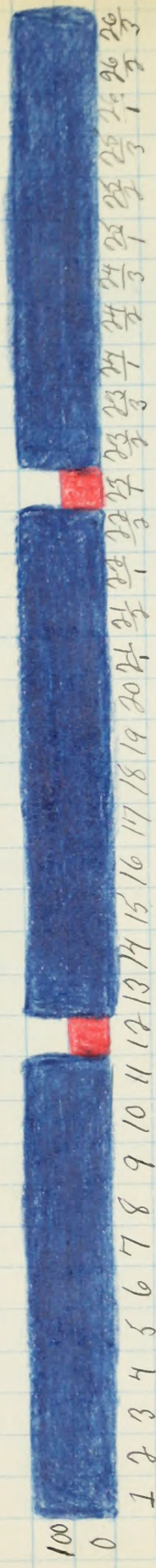
1<sup>st</sup> Trial October 24, 1928 - January 21, 1929.



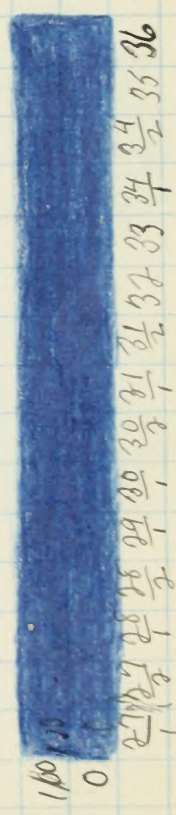
1<sup>st</sup> Trial Con't



2<sup>nd</sup> Trial January 21, 1929 March 18, 1929.



2<sup>nd</sup> Trial Con't

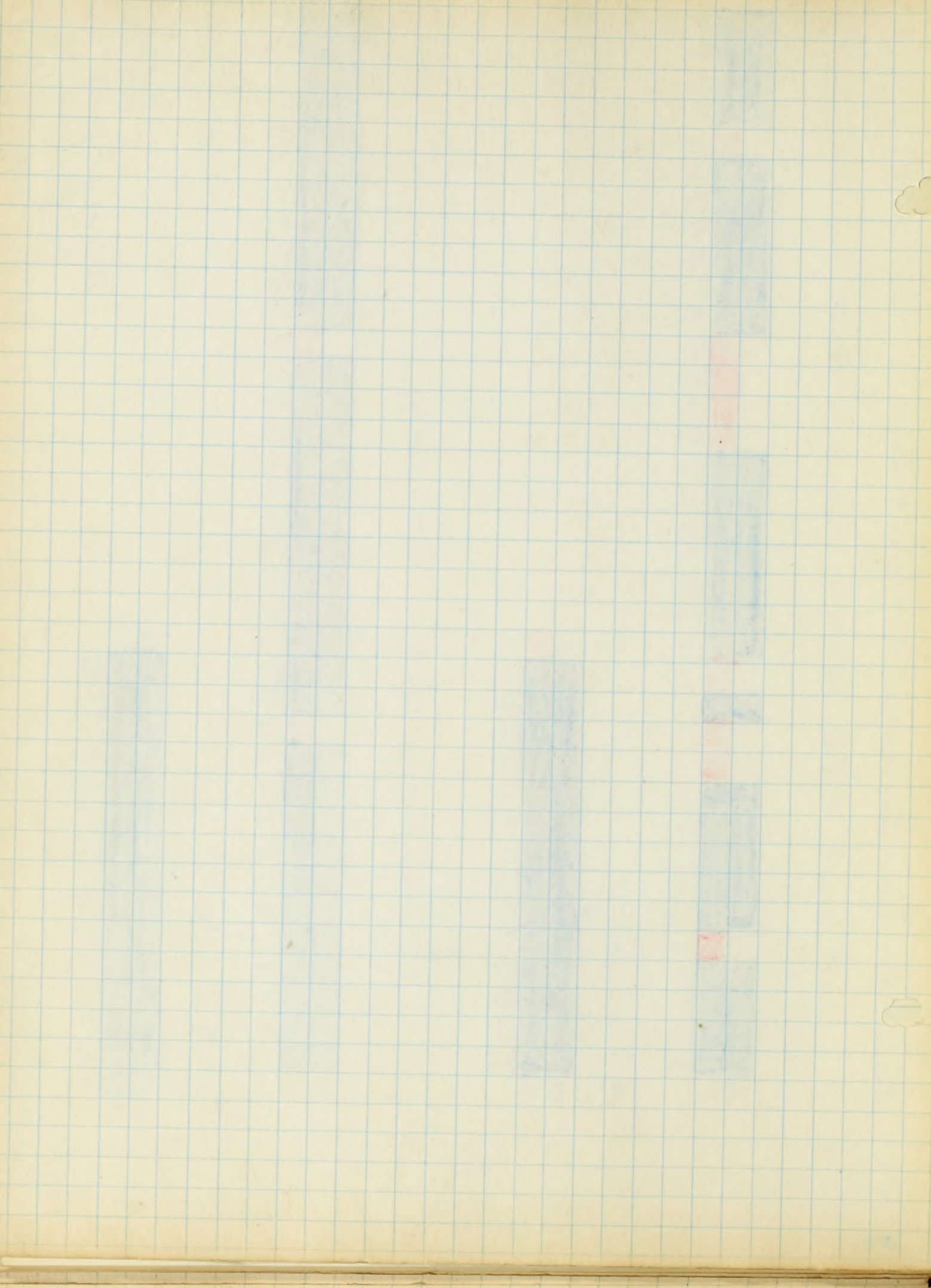


100% efficiency  
of failures

Chart No. 28.

Francis L.







DISTRIBUTION OF SCORES  
TO SHOW  
PROGRESSION TOWARDS  
100% EFFICIENCY  
IN FUNCTIONAL ARITHMETIC  
IN DRILL SERVICE IN LONG DIVISION  
  
(PENALTY SCORE BASIS)  
  
(See Charts No. 29-80)  
  
GRADE V 70 Pupils  
  
GRADE VI 36 Pupils



1. The first part of the report

2. The second part of the report

3. The third part of the report

4. The fourth part of the report

5. The fifth part of the report

6. The sixth part of the report

7. The seventh part of the report

8. The eighth part of the report

9. The ninth part of the report

10. The tenth part of the report







GRADE V - 70 PUPILSDISTRIBUTION OF SCORES TO SHOWPROGRESSION TOWARDS 100% EFFICIENCYIN THE WORK BOOK AND DRILLSERVICE IN LONG DIVISIONBASIS - PENALTY SCORE. (SEE CHARTS No. 29 - 30)THE CHARTS ARE READ AS FOLLOWS:

O-70 Frequencies

O-100 Score


 = 100% Efficiency = 0 FailureAMOUNT OF TIME

First Trial from October 24, 1928 - January 15, 1929

Second Trial from January 21, 1929 - March 18, 1929

Ten or twenty minutes were allowed daily for the Long  
Division Drill

1. NOTE. Most drills containing more than ten examples were divided into  
smaller sets (see  $\frac{24}{1} \frac{24}{2} \frac{24}{3}$ )
2. NOTE. Two sets of drills were given each day from March 1 to March 18,  
one in the morning (A.M.) the other one in the afternoon (P.M.)

NOTE.  - failure - A child who failed to receive 100%  
in a group was a failure in that group until that group  
was corrected and 100% obtained.

CHAPTER 1. INTRODUCTION

1.1. THE PROBLEM

1.2. THE SCOPE OF THE STUDY

1.3. THE OBJECTIVES OF THE STUDY

1.4. THE SIGNIFICANCE OF THE STUDY

1.5. THE LIMITATIONS OF THE STUDY

1.6. THE ORGANIZATION OF THE STUDY

1.7. THE DEFINITION OF TERMS

1.8. THE SUMMARY

1.9. THE CONCLUSION

1.10. THE REFERENCES

1.11. THE APPENDICES

1.12. THE BIBLIOGRAPHY

1.13. THE GLOSSARY

1.14. THE INDEX

1.15. THE LIST OF FIGURES

1.16. THE LIST OF TABLES

1.17. THE LIST OF REFERENCES

1.18. THE LIST OF APPENDICES

1.19. THE LIST OF GLOSSARY

1.20. THE LIST OF INDEX

1.21. THE LIST OF BIBLIOGRAPHY

1.22. THE LIST OF REFERENCES

1.23. THE LIST OF APPENDICES



## LONG DIVISION DRILL SERVICE GROUP I-1

GRADE V

RULE I

PAGE 6

Oct. 24, 1928 Jan. 21, 1929

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION TO SHOW PROGRESSION

TOWARDS 100% EFFICIENCY (PENALTY SCORE BASIS)

GROUP I-1 DRILL SERVICE GIVEN TWICE

Oct. 24, 1928

and

Jan. 21, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Oct. 24 (Median 100

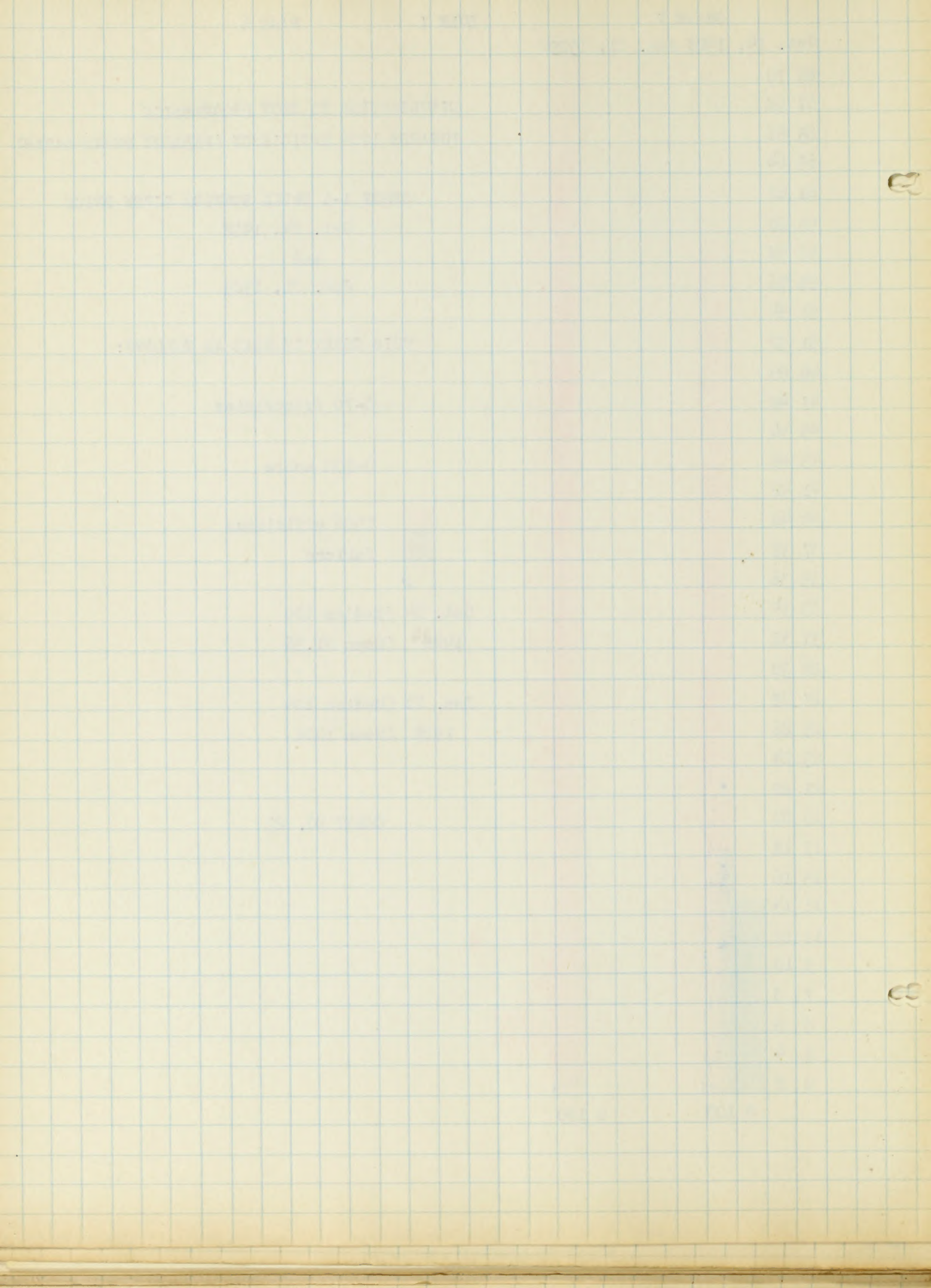
1928 (Mean 81.5%

Jan. 21 (Median 100

1929 (Mean 100%

CHART NO. 29







## LONG DIVISION DRILL SERVICE

GROUP I-2

GRADE V

RULE I

PAGE 6

Oct. 25, 1928 Jan. 22, 1929

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP I-2 DRILL SERVICE GIVEN TWICE  
Oct 25, 1928  
and  
Jan. 22, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency  
failure

Oct. 25 (Median 100  
1928 (Mean 68.6%

Jan. 22 (Median 100  
1929 (Mean 97.1%

CHART NO. 30



STATIONER'S OFFICE  
1000 1/2 STREET  
N.W. WASHINGTON, D.C.

RECEIVED  
JAN 10 1910

THE SECRETARY OF THE

NAVY DEPARTMENT

WASHINGTON, D.C.

DEAR SIR:

I have the honor to

acknowledge the receipt

of your letter

1000 1/2 STREET  
N.W. WASHINGTON, D.C.  
JAN 10 1910  
RECEIVED  
JAN 10 1910  
THE SECRETARY OF THE  
NAVY DEPARTMENT  
WASHINGTON, D.C.  
DEAR SIR:  
I have the honor to  
acknowledge the receipt  
of your letter  
of the 10th inst.

2

2



## LONG DIVISION DRILL SERVICE

GROUP I-3

 GRADE V  
 Oct. 26, 1928 Jan. 23, 1929

RULE I

PAGE 6

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

 DISTRIBUTION OF SCORES TO SHOW  
 PROGRESSION TOWARDS 100% EFFICIENCY  
 (Penalty Score Basis)

GROUP I-3 DRILL SERVICE GIVEN TWICE

Oct. 26, 1928

and

Jan. 23, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Oct. 26 (Median 100

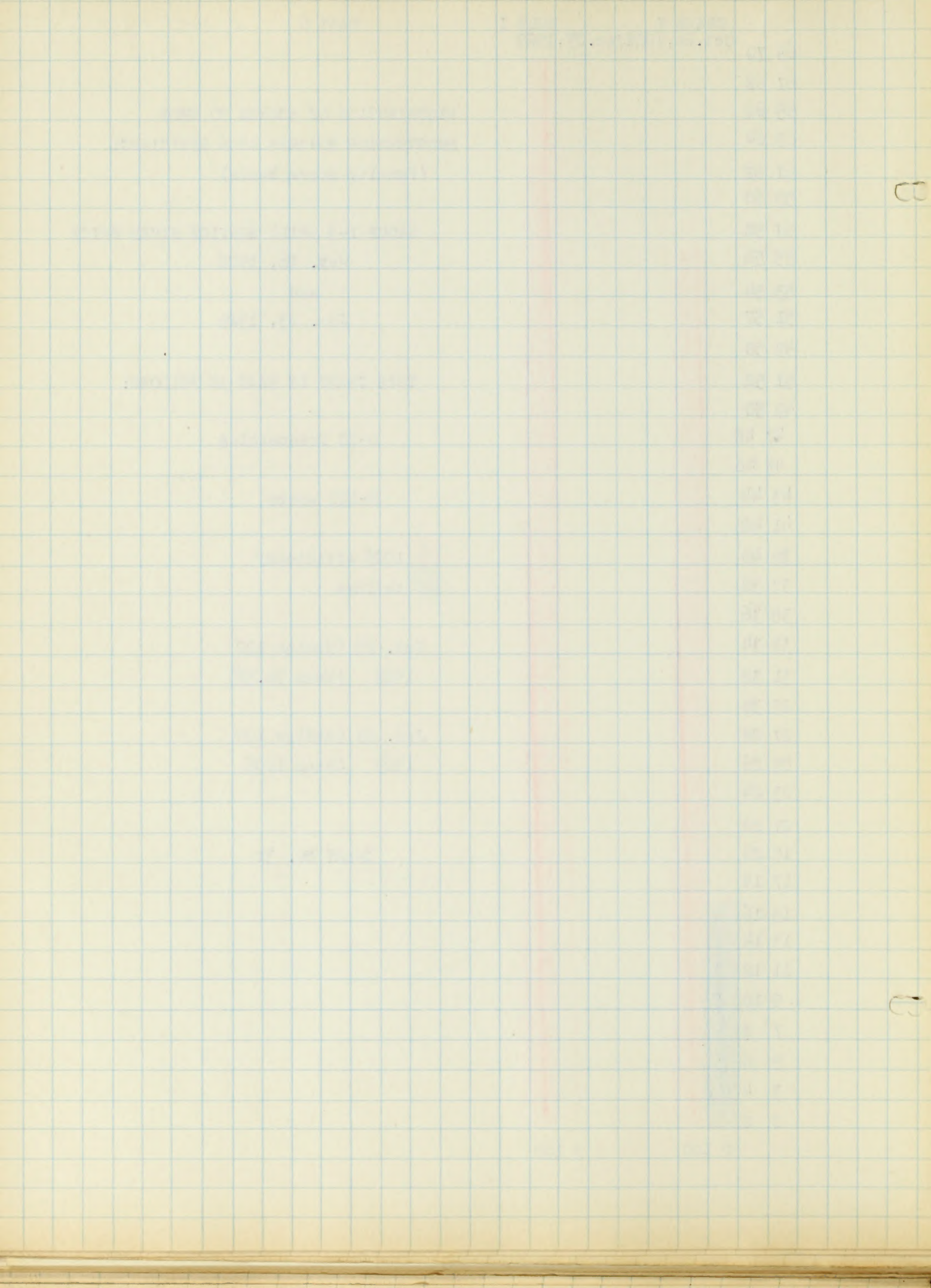
1928 (Mean 78.5%)

Jan. 23 (Median 100

1929 (Mean 100%)

CHART NO. 31







## LONG DIVISION DRILL SERVICE

GROUP I-5

GRADE V

RULE I

PAGE 6

Oct. 29, 1928 Jan. 24, 1929

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP I-4 DRILL SERVICE GIVEN TWICE

Oct. 29, 1928

and

Jan. 24, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Oct. 29 (Median 100

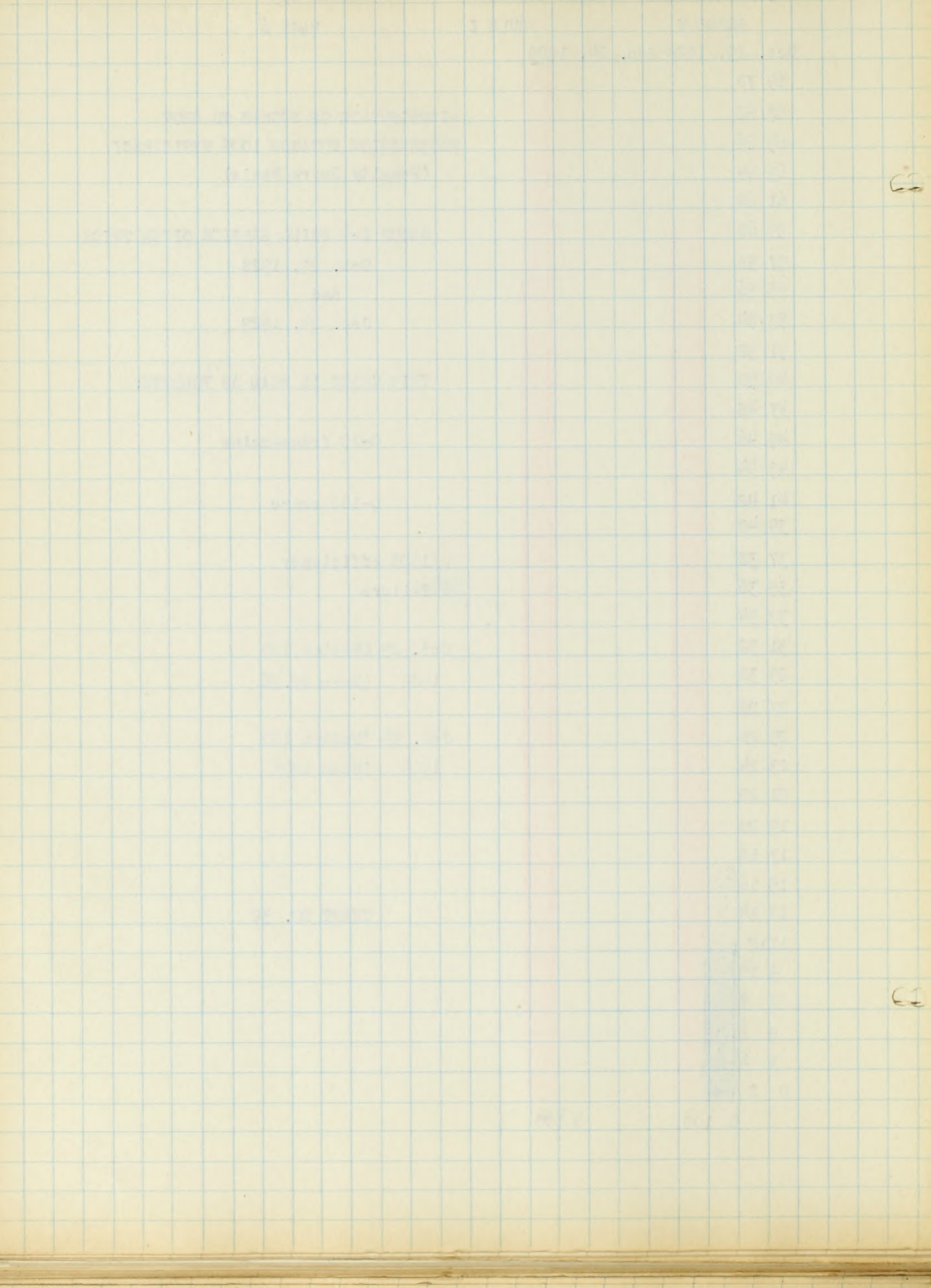
1928 (Mean 85.7%

Jan. 24 (Median 100

1929 (Mean 100%

CHART NO. 32







## LONG DIVISION DRILL SERVICE

GROUP I-5

GRADE V

RULE I

PAGE 6

Oct. 30, 1928 Jan. 28, 1929

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP I-5 DRILL SERVICE GIVEN TWICE

Oct. 30, 1928

and

Jan. 28, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Oct. 30 (Median 100

1928 (Mean 77.1%)

Jan. 28 (Median 100

1929 (Mean 100%)

CHART NO. 33







## LONG DIVISION DRILL SERVICE GROUP I-6

GRADE V

RULE I

PAGE 7

Oct. 31, 1928 Jan. 28, 1929

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP I-6 DRILL SERVICE GIVEN TWICE

Oct. 31, 1928

and

Jan. 28, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Oct. 31 (Median 100

1928 (Mean 85.7%)

Jan. 28 (Median 100

1929 (Mean 100%)

CHART NO. 34



Page 1

Page 1

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Page 1



## LONG DIVISION DRILL SERVICE GROUP I-7

GRADE V

Page 7

Nov. 1, 1928 Jan. 29, 1929

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP I-7 DRILL SERVICE GIVEN TWICE

Nov. 1, 1928

and

Jan. 29, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Nov. 1 (Median 100

1928 (Mean 94.2%

Jan. 29 (Median 100

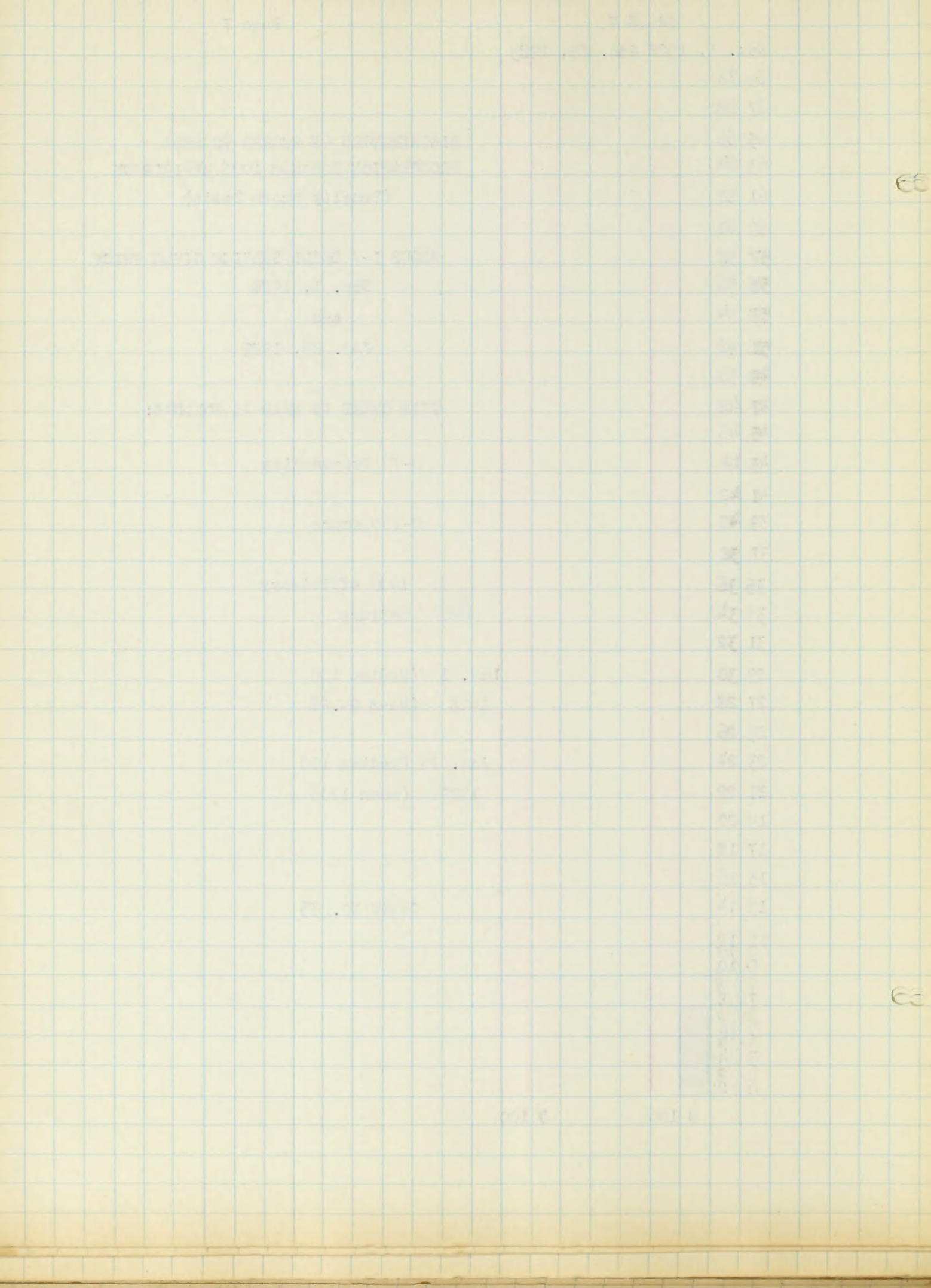
1929 (Mean 100%

CHART NO. 35

0 100

0 100







GRADE V

RULE I

Nov. 2, 1928 Jan. 30, 1929

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP I-8 DRILL SERVICE GIVEN TWICE

Nov. 2, 1928

and

Jan. 30, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Nov. 2 (Median 100

1928 (Mean 81.4%)

Jan. 30 (Median 100

1929 (Mean 100%)

CHART NO. 36







GRADE V

RULE I

PAGE 7

Nov. 5, 1928 Jan. 31, 1929

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP I-9 DRILL SERVICE GIVEN TWICE

Nov. 5, 1928

and

Jan. 31, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Nov. 5 (Median 100

1928 (Mean 81.4%

Jan. 31 (Median 100

1929 (Mean 100%

CHART NO. 37







## LONG DIVISION DRILL SERVICE

GROUP I-10

GRADE V

RULE I

PAGE 7

Nov. 6, 1928 Feb. 1, 1929

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP I-10 DRILL SERVICE GIVEN TWICE

Nov. 6, 1928

and

Feb. 1, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency  
failure

Nov. 6 (Median 100  
1928 (Mean 87.1%)

Feb. 1 (Median 100  
1929 (Mean 100%)

CHART NO. 38







GRADE V

RULE I

Nov. 7, 1928 Feb. 4, 1929

65 66  
63 64  
61 62  
59 60  
57 58  
55 56  
53 54  
51 52  
49 50  
47 48  
45 46  
43 44  
41 42  
39 40  
37 38  
35 36  
33 34  
31 32  
29 30  
27 28  
25 26  
23 24  
21 22  
19 20  
17 18  
15 16  
13 14  
11 12  
9 10  
7 8  
5 6  
3 4  
0 2

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP II-1 DRILL SERVICE GIVEN TWICE

Nov. 7, 1928



and

Feb. 4, 1929

THIS CHART IS READ AS FOLLOWS:

0-66 frequencies

0-100 score

 100% efficiency  
 failure

Nov. 5 (Median 100

1928 (Mean 67.1%

Feb. 4 (Median 100

1929 (Mean 94.2%

CHART NO. 39

0 100

0 100







## LONG DIVISION DRILL SERVICE

GROUP II-2

GRADE V

RULE I

PAGE 9

Nov. 8, 1928 Feb. 5, 1929

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP II-2 DRILL SERVICE GIVEN TWICE

Nov. 8, 1928

and

Feb. 5, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Nov. 8 (Median 100

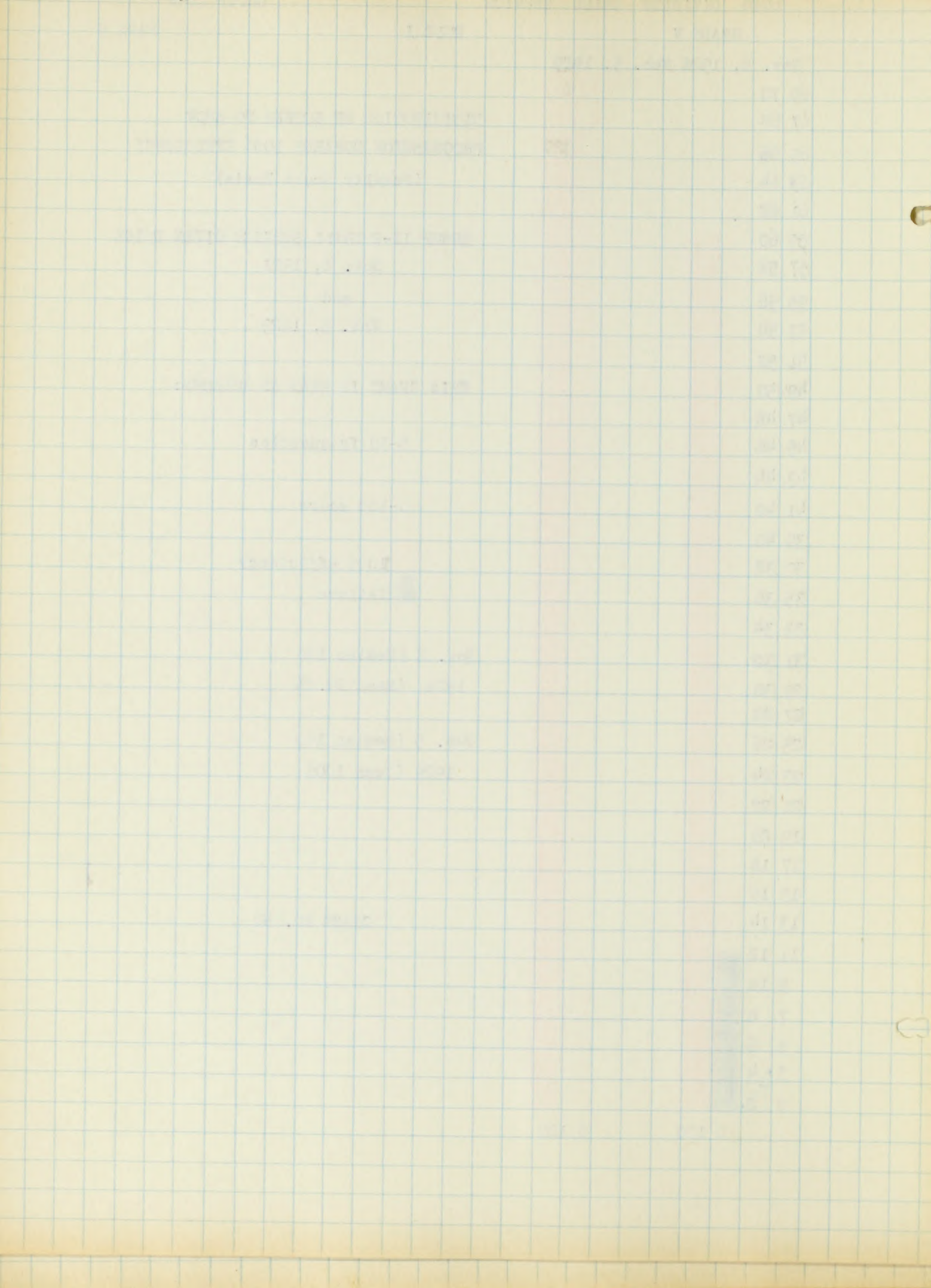
1928 (Mean 84.2%)

Feb. 5 (Median 100

1929 (Mean 100%)

CHART NO. 40







GRADE V

RULE I

PAGE 9

## DISTRIBUTION OF SCORES TO SHOW PROGRESSION TOWARDS 100% EFFICIENCY

(Penalty Basis Score)

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

GROUP II-3 DRILL SERVICE GIVEN TWICE

Nov. 9, 1928

and

Feb. 6, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Nov. 9 (Median 100

1928 (Mean 95.7%

Feb. 6 (Median 100

1929 (Mean 100%

CHART NO. 41







## LONG DIVISION DRILL SERVICE

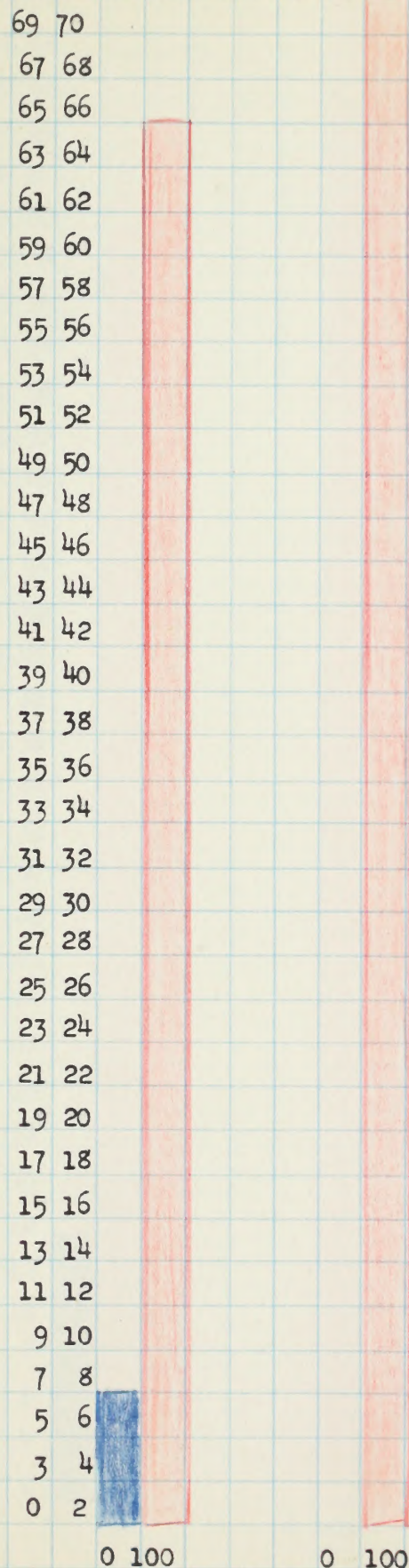
GROUP II-4

Page 9

GRADE V

RULE I

Nov. 12 1928 Feb. 7, 1929



DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP II-4 DRILL SERVICE GIVEN TWICE

Nov. 12, 1928

and

Feb. 7, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Nov. 12 (Median 100

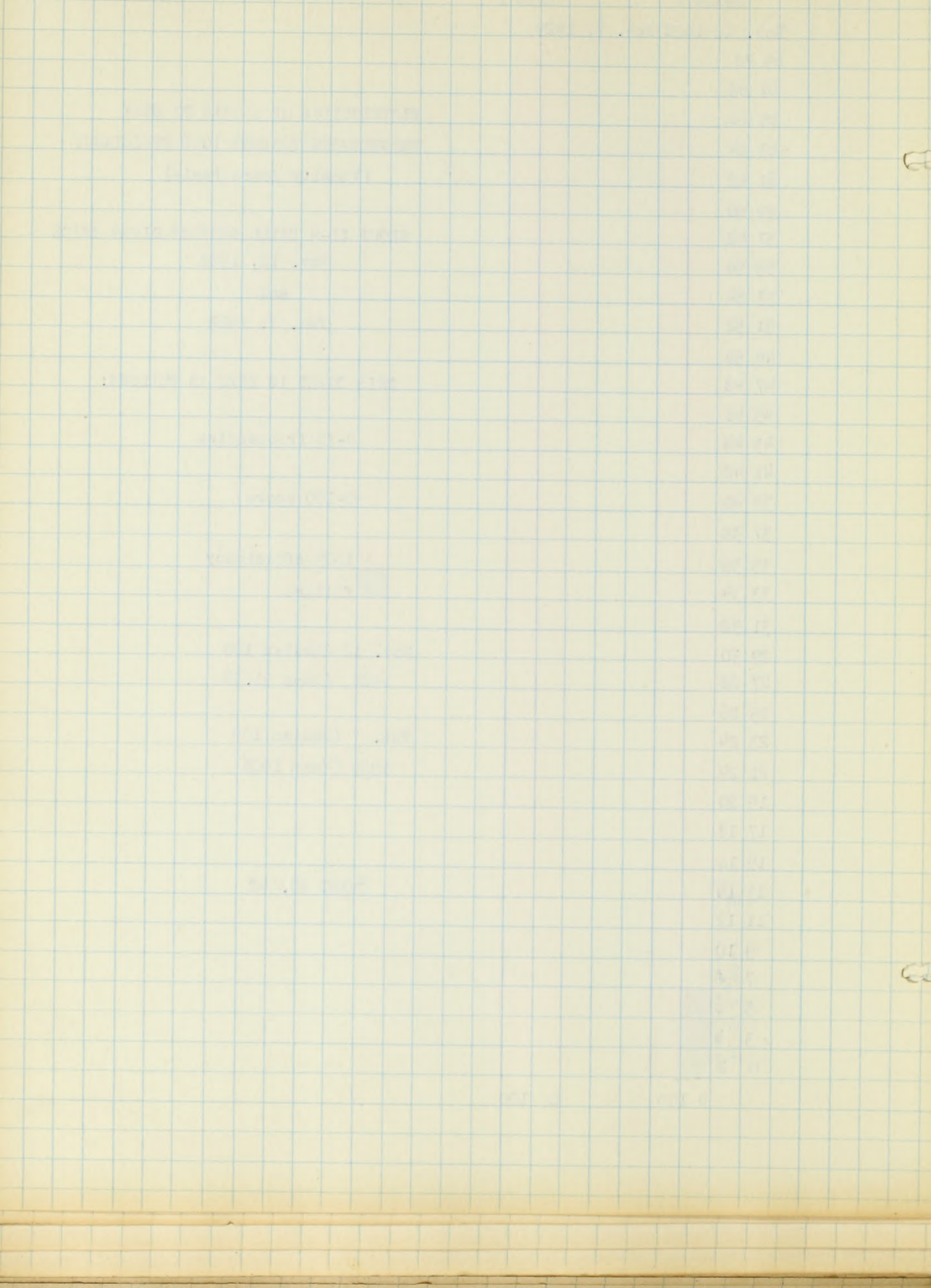
1928 (Mean 91.4%)

Feb. 7 (Median 100

1929 (Mean 100%)

CHART NO. 42







## LONG DIVISION DRILL SERVICE

GROUP II-5

GRADE V

RULE I

PAGE 10

Nov. 13, 1928 Feb. 8, 1929

69 70

67 68

65 66

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61 62

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57 58

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51 52

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37 38

35 36

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP II-5 DRILL SERVICE GIVEN TWICE  
Nov. 13, 1928 and  
Feb. 8, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Nov. 13 (Median 100  
1928 (Mean 82.7%

Feb. 8 (Median 100  
1929 (Mean 100%

CHART NO. 43



THE UNIVERSITY OF CHICAGO  
DEPARTMENT OF CHEMISTRY  
CHICAGO, ILL.

REPORT OF THE  
COMMISSIONER OF THE  
BUREAU OF MINES

FOR THE YEAR  
1907

BY

JOHN W. COOPER

CHIEF OF BUREAU

U. S. DEPARTMENT OF THE INTERIOR

BUREAU OF MINES

WASHINGTON, D. C.

1908

U. S. GOVERNMENT

1908

1908



LONG DIVISION DRILL SERVICE

GROUP II-6

GRADE V

RULE I

PAGE 10

Nov. 14, 1928 Feb. 11, 1929

69 70

67 68

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61 62

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP II-6 DRILL SERVICE GIVEN TWICE

Nov. 14, 1928

and

Feb. 11, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Nov. 14 (Median 100

1928 (Mean 82.7%

Feb. 8 (Median 100

1929 (Mean 100%

CHART NO. 44

0 100

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THE STATE OF TEXAS,  
COUNTY OF DALLAS.

I, the undersigned, Judge of the County of Dallas, Texas,

do hereby certify that

the within and

correctly set forth

the facts and circumstances

as stated in the

within and

correctly set forth

the facts and

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GRADE V

RULE I

PAGE 10

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43 44

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37 38

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP II-7 DRILL SERVICE GIVEN TWICE

Nov. 15, 1928

and

Feb. 12, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Nov. 15 (Median 100

1928 (Mean 97.1%

Feb. 12 (Median 100

1929 (Mean 100%

CHART NO. 45



1. 12-11-19  
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GRADE V

RULE I

PAGE 10

Nov. 16 1928 Feb. 13, 1929

69 70

67 68

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61 62

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37 38

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP II-8 DRILL SERVICE GIVEN TWICE

Nov. 16, 1928

and

Feb. 13, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Nov. 16 (Median 100

1928 (Mean 87.5%

Feb. 13 (Median 100

1929 (Mean 100%

CHART NO. 46



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## LONG DIVISION DRILL SERVICE

GROUP II-9

GRADE V

RULE I

PAGE 10

Nov. 19, 1928 Feb. 14, 1929

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65 66

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59 60

57 58

55 56

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP II-9 DRILL SERVICE GIVEN TWICE

Nov. 19, 1928

and

Feb. 14, 1929

THIS CHART IS READ AS FOLLOWS:

0-68 frequencies

0-100 score

100% efficiency

failure

Nov. 19 (Median 100

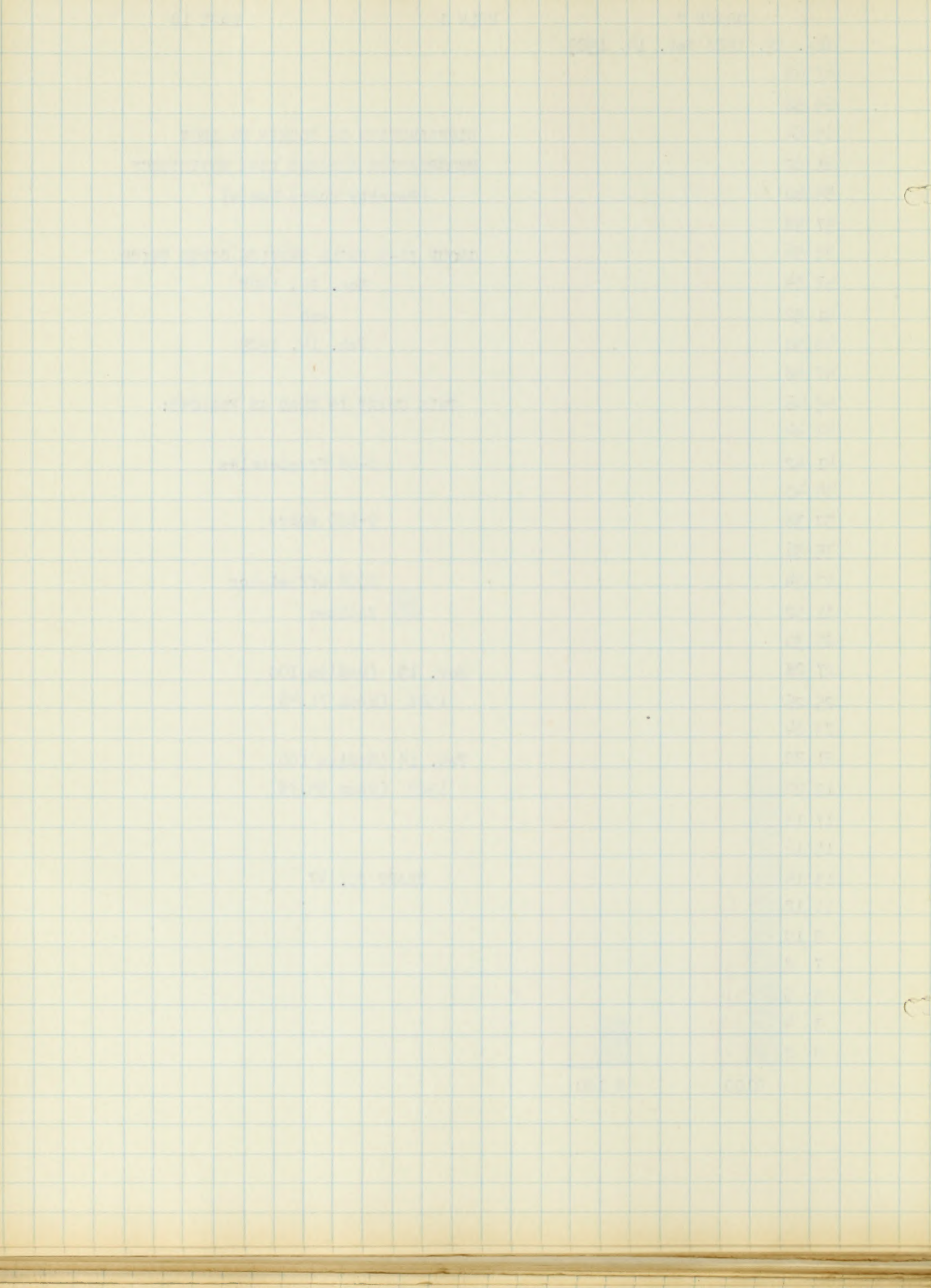
1928 (Mean 71.4%)

Feb. 14 (Median 100

1929 (Mean 95.7%)

CHART NO. 47







LONG DIVISION DRILL SERVICE

GROUP II-10

GRADE V

RULE I

PAGE 10

Nov. 20, 1928 Feb. 15, 1929

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

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43 44

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35 36

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP II-10 DRILL SERVICE GIVEN TWICE

Nov. 20, 1928

and

Feb. 15, 1929

THIS CHART IS READ AS FOLLOWS:

0-68 frequencies

0-100 score

100% efficiency

failure

Nov. 20 (Median 100

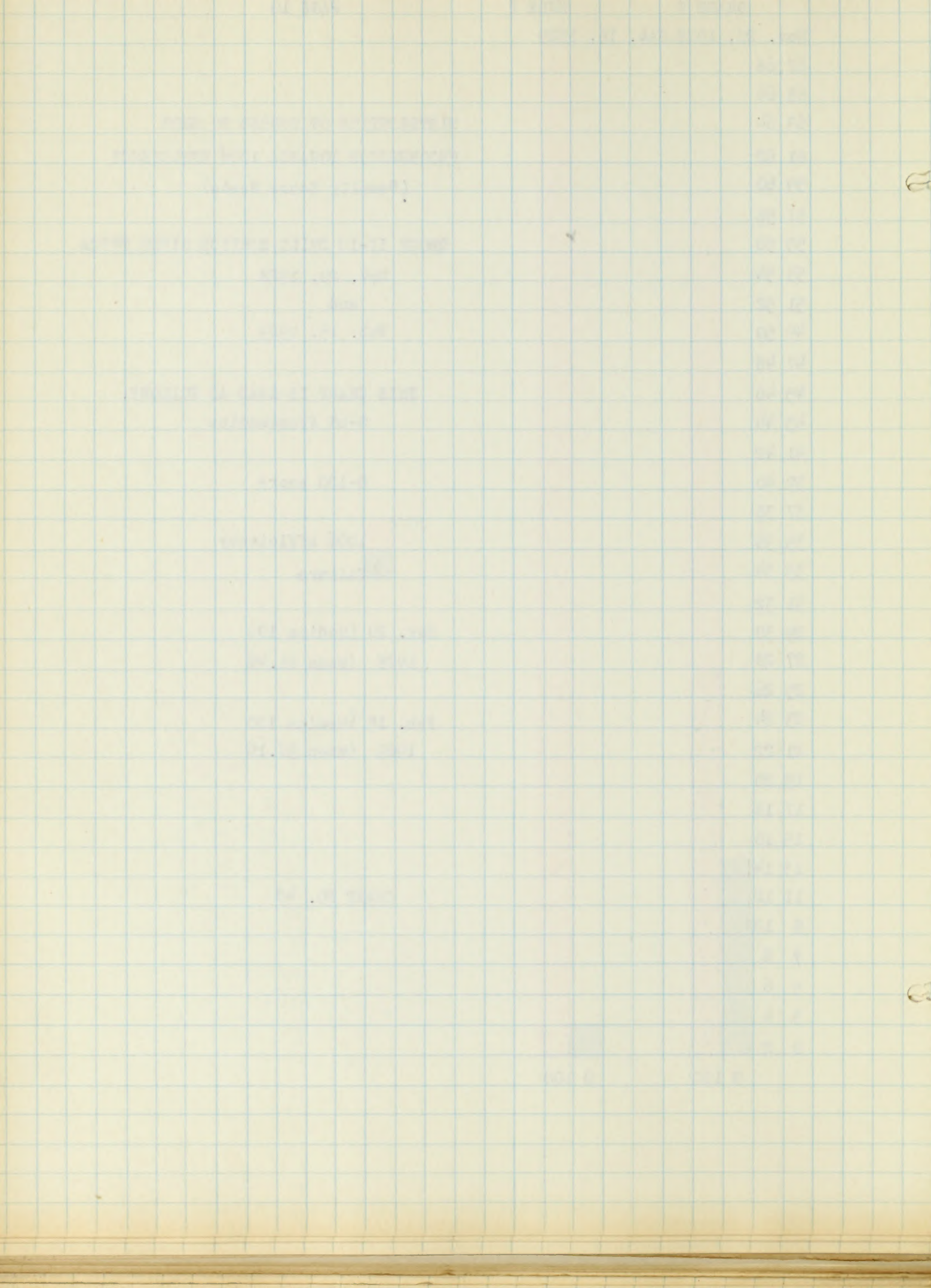
1928 (Mean 81.4%)

Feb. 15 (Median 100

1929 (Mean 97.1%)

CHART NO. 48







LONG DIVISION DRILL SERVICE

GROUP III- $\frac{21}{1}$ 

GRADE V

RULE I

PAGE 12

Nov. 21, 1928 Feb. 17, 1929

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65 66

63 64

61 62

59 60

57 58

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53 54

51 52

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47 48

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

(Penalty Score Basis)

GROUP III- $\frac{21}{1}$  DRILL SERVICE GIVEN TWICE

Nov. 21, 1928

and

Feb. 18, 1929

THIS CHART IS READ AS FOLLOWS:

0-68 frequencies

0-100 score

100% efficiency

failure

Nov. 21 (Median 100

1928 (Mean 62.8%

Feb. 18 (Median 100

1929 (Mean 97.1%

CHART NO. 49



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GRADE V RULE I Exceptions

Page 13

Dec. 17, 1928 Mar. 7, 1929

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

(Penalty Score Basis)

GROUP IV -  $\frac{21}{2}$  Exceptions  
DRILL SERVICE GIVEN TWICE

Dec. 14, 1928

and

Mar. 7, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

0-68 frequencies

0-100 score

100% efficiency

failure

Dec. 17 (Median 100

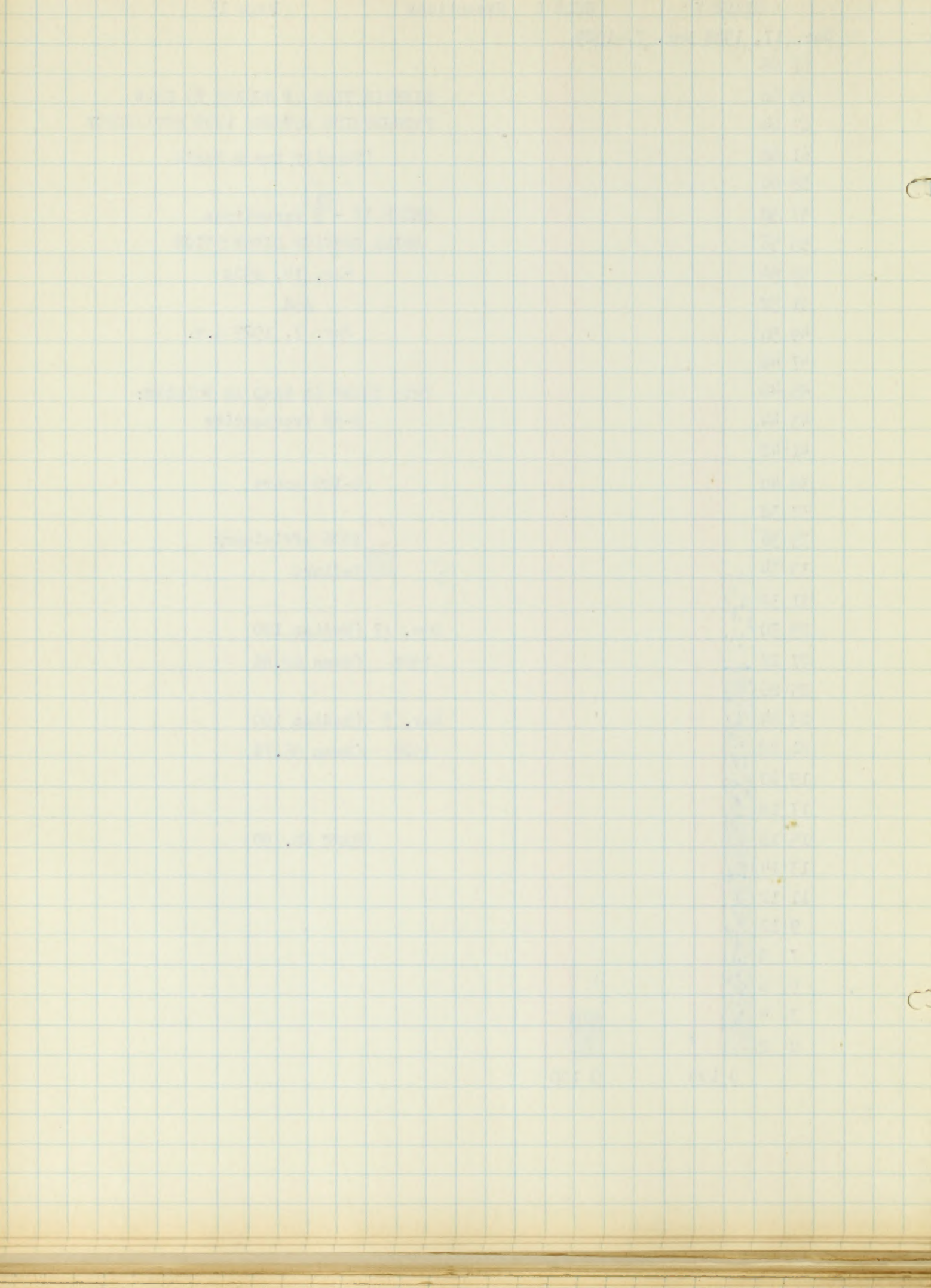
1928 (Mean 62.8%)

Mar. 7 (Median 100

1929 (Mean 95.7%)

CHART NO. 50







GRADE V

RULE I

PAGE 14

Nov. 22, 1928 Feb. 19, 1929

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

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17 18

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13 14

11 12

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP V- $\frac{22}{1}$  DRILL SERVICE GIVEN TWICE  
Nov. 22, 1928  
and  
Feb. 19, 1929

THIS CHART IS READ AS FOLLOWS:

0-66 frequencies

0-100 score

100% efficiency

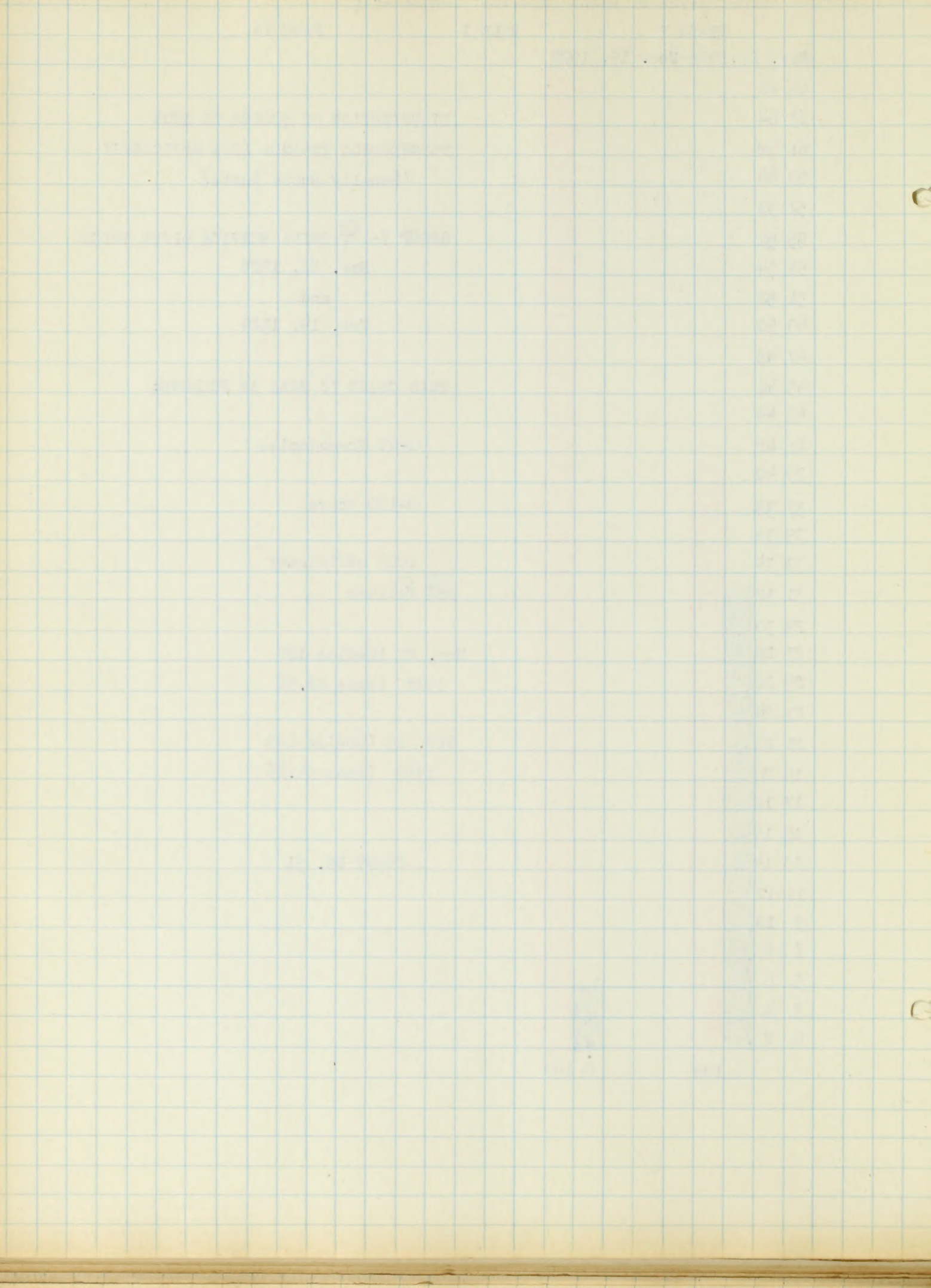
failure

Nov. 22 (Median 100  
1928 (Mean 98.5%)

Feb. 19 (Median 100  
1929 (Mean 94.2%)

CHART NO. 51







GRADE V

RULE I

Page 14

Nov. 23, 1928 Feb. 20, 1929

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP V- $\frac{22}{2}$  DRILL SERVICE GIVEN TWICE

Nov. 23, 1928

and

Feb. 20, 1929

THIS CHART IS READ AS FOLLOWS:  
0-66 frequencies

0-100 score

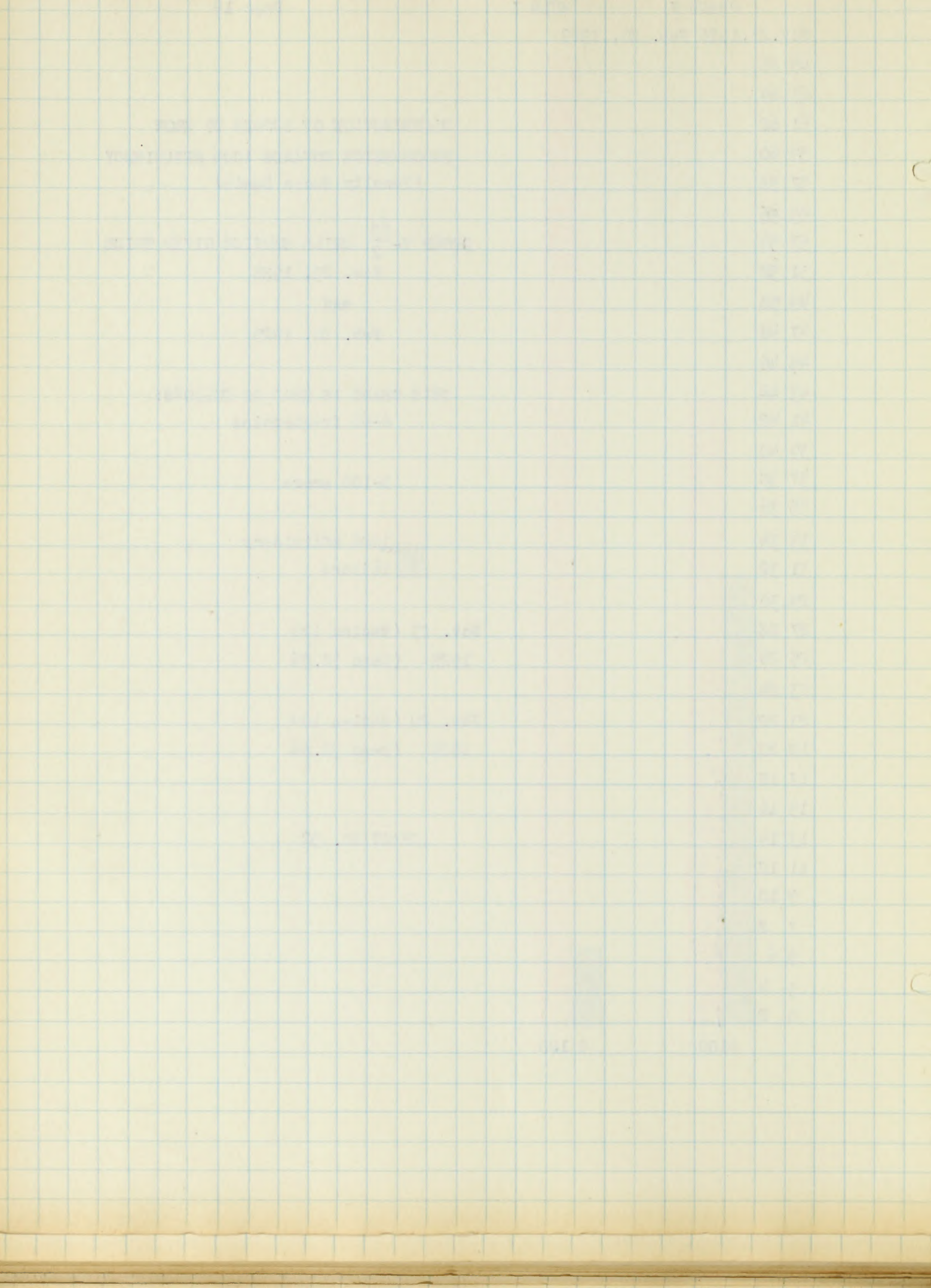
100% efficiency  
failure

Nov. 23 (Median 100  
1928 (Mean 58.5%)

Feb. 20 (Median 100  
1929 (Mean 92.8%)

CHART NO. 52







LONG DIVISION DRILL SERVICE GROUP VI- $\frac{23}{1}$ 

GRADE V

RULE I

PAGE 15

Nov. 26, 1928 Feb. 21, 1929

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

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27 28

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DISTRIBUTION OF SCORES TO SHOW PROGRESSION  
TOWARDS 100% EFFICIENCY (Penalty Score Basis)

GROUP VI- $\frac{23}{1}$  DRILL SERVICE GIVEN TWICE

Nov. 26, 1928

and

Feb. 21, 1929

THIS CHART IS READ AS FOLLOWS:

0-68 frequencies

0-100 score

100% efficiency

failure

Nov. 26 (Median 100

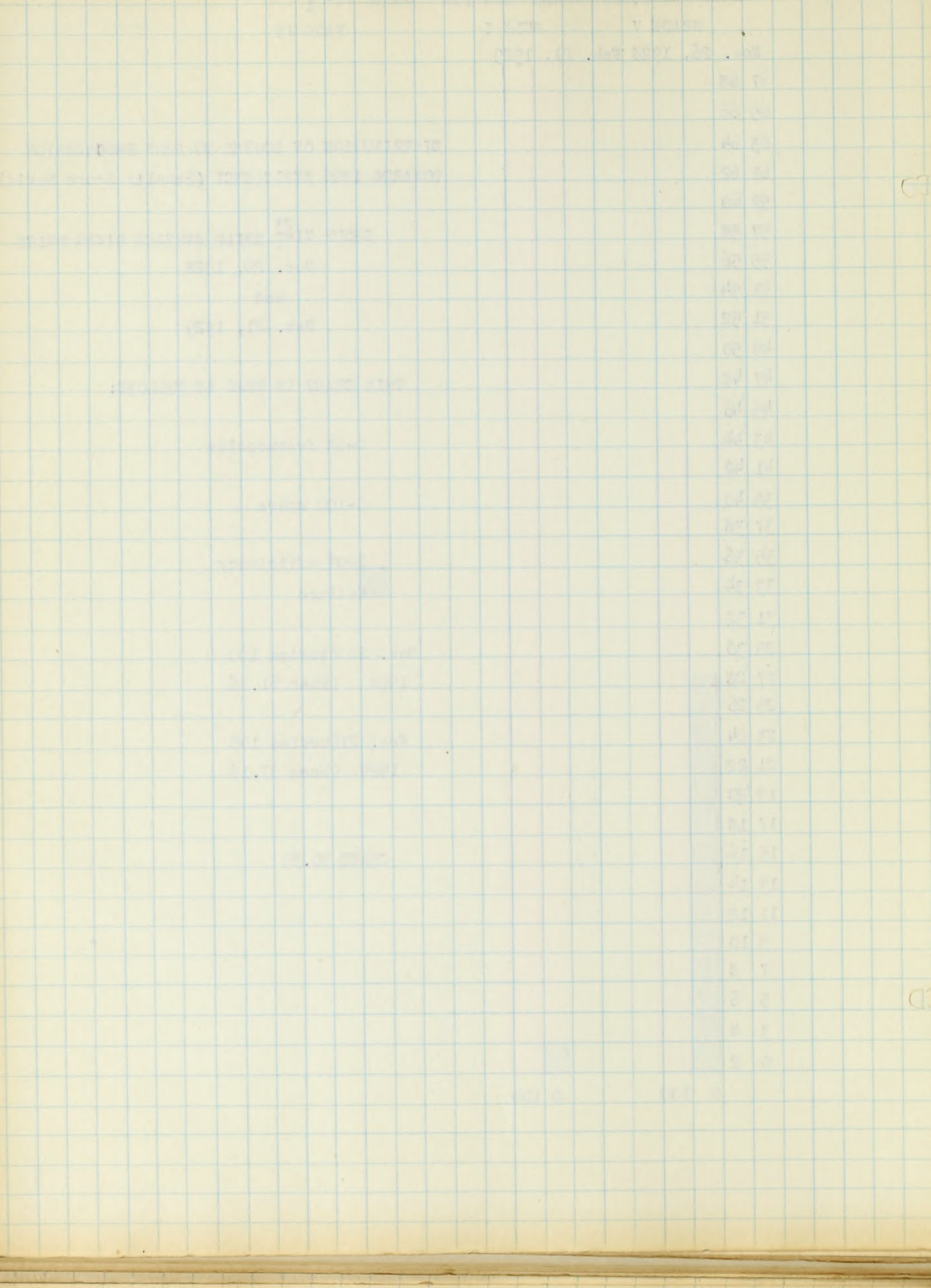
1928 (Mean 61.4%

Feb. 21 (Median 100

1929 (Mean 97.1%

CHART NO. 53







LONG DIVISION DRILL SERVICE

GROUP VI- $\frac{23}{2}$ 

GRADE V

RULE I

PAGE 15

Nov. 27, 1928 Feb. 25, 1929

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

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7 8

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP VI- $\frac{23}{2}$  DRILL SERVICE GIVEN TWICE

Nov. 28, 1928

and

Feb. 25, 1929

THIS CHART IS READ AS FOLLOWS:

0-58 frequencies

0-100 score

100% efficiency

failure

Nov. 27 (Median

1928 (Mean 38.5%)

Feb. 25 (Median 100

1929 (Mean 82.8%)

CHART NO. 54







GRADE V

RULE I

PAGE 15

Nov. 28, 1928 Feb. 26, 1929

63 64  
61 62  
59 60  
57 58  
55 56  
53 54  
51 52  
49 50  
47 48  
45 46  
43 44  
41 42  
39 40  
37 38  
35 36  
33 34  
31 32  
29 30  
27 28  
25 26  
23 24  
21 22  
19 20  
17 18  
15 16  
13 14  
11 12  
9 10  
7 8  
5 6  
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

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP VI- $\frac{23}{3}$  DRILL SERVICE GIVEN TWICE  
Nov. 28, 1928  
and  
Feb. 26, 1929

THIS CHART IS READ AS FOLLOWS:

0-64 frequencies

0-100 score

 100% efficiency  
 failure

Nov. 28 (Median 100  
1928 (Mean 57.5%)

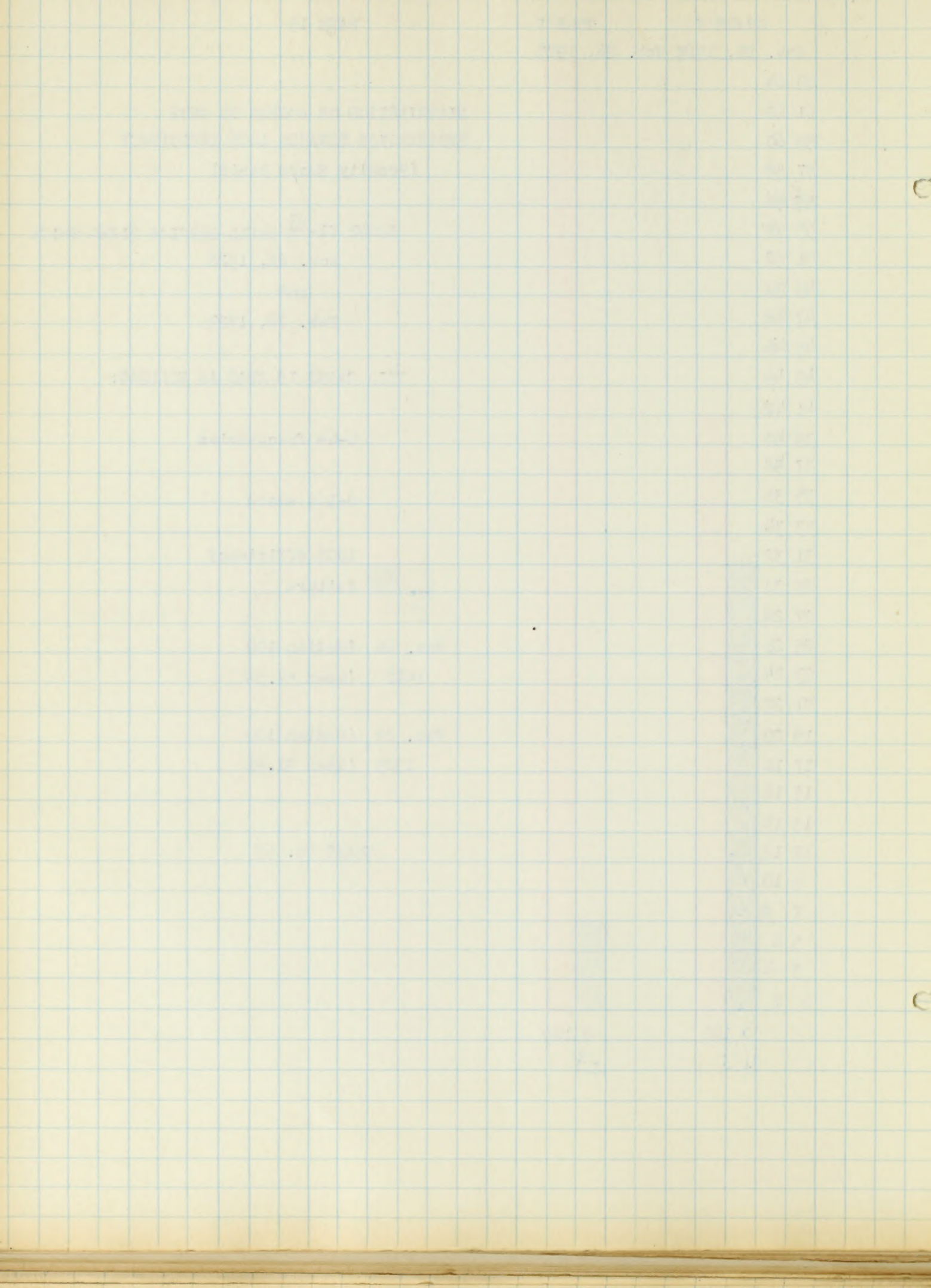
Feb. 26 (Median 100  
1929 (Mean 91.4%)

CHART NO. 55

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## LONG DIVISION DRILL SERVICE

GROUP VII-<sup>24</sup><sub>I</sub>

GRADE V

RULE I

PAGE 16

Dec. 3, 1928 Feb. 27, 1929

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63 64

61 62

59 60

57 58

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53 54

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47 48

45 46

43 44

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37 38

35 36

33 34

31 32

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

(Penalty Score Basis)

GROUP VII-<sup>24</sup><sub>I</sub> DRILL SERVICE GIVEN TWICE

Dec. 3, 1928

and

Feb. 27, 1929

THIS CHART IS READ AS FOLLOWS:

0-69 frequencies

0-100 score

100% efficiency

failure

Dec. 3 (Median 100

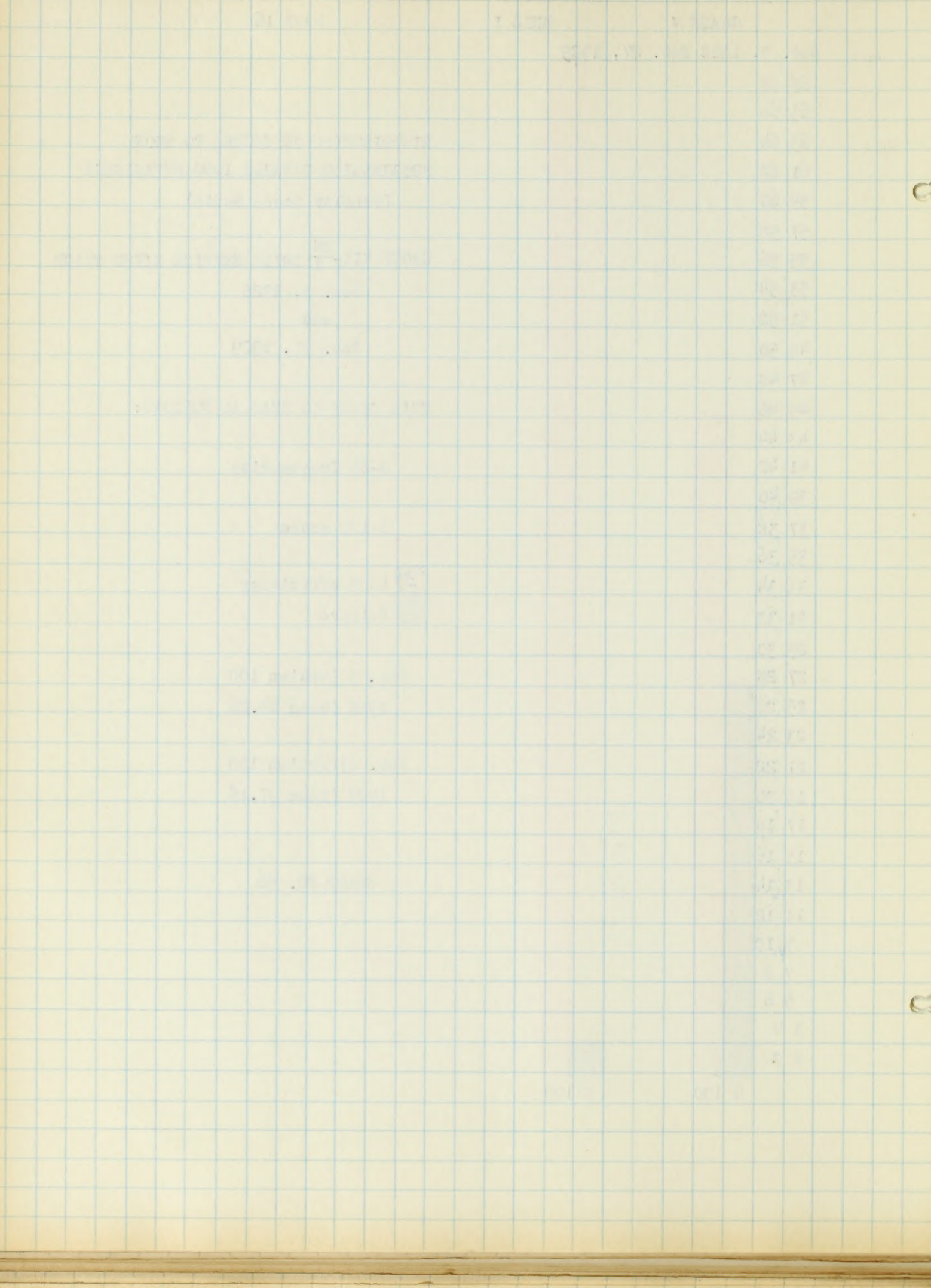
1928 (Mean 64.2%)

Feb. 27 (Median 100

1929 (Mean 97.1%)

CHART NO. 56







GRADE V

RULE I

PAGE 16

Dec. 4, 1928 Feb. 28, 1929

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

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27 28

25 26

23 24

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP VII- $\frac{24}{1}$  DRILL SERVICE GIVEN TWICE  
Dec. 4, 1928  
and  
Feb. 28, 1929

THIS CHART IS READ AS FOLLOWS:

0-60 frequencies

0-100 score

100% efficiency

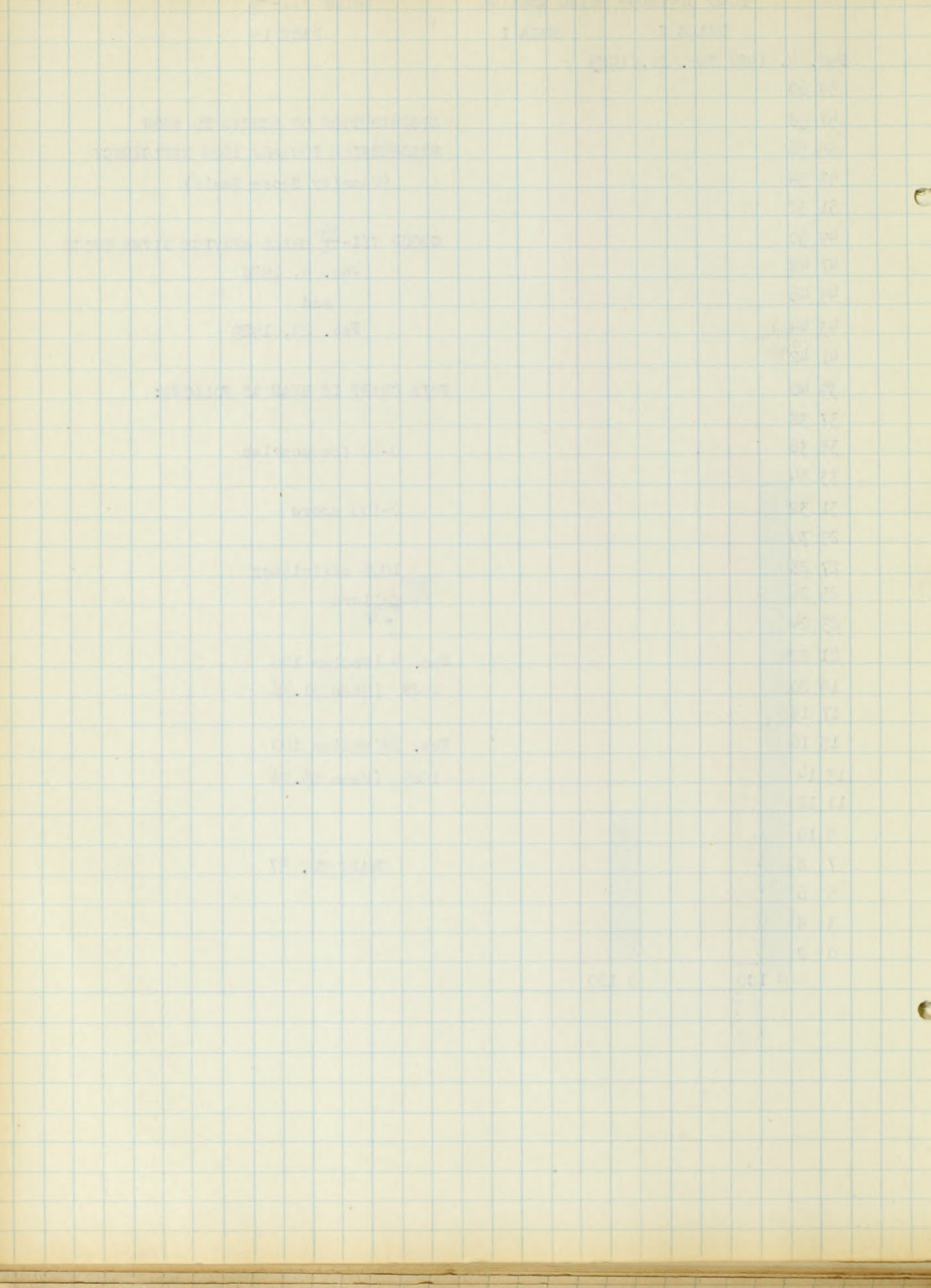
failure

Dec. 4 (Median 100  
1928 (Mean 51.4%)

Feb. 28 (Median 100  
1929 (Mean 85.7%)

CHART NO. 57







LONG DIVISION DRILL SERVICE

GROUP VII-  $\frac{24}{3}$ 

GRADE V

RULE I

PAGE 16

Dec. 5, 1928 Mar. 1, 1929

65 66

63 64

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57 58

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51 52

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43 44

41 42

39 40

37 38

35 36

33 34

31 32

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27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP VII-  $\frac{24}{2}$  DRILL SERVICE GIVEN TWICE

Dec. 5, 1928

and

Mar. 1, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

0-66 frequencies

0-100 score

100% efficiency

failure

Dec. 5 (Median 100

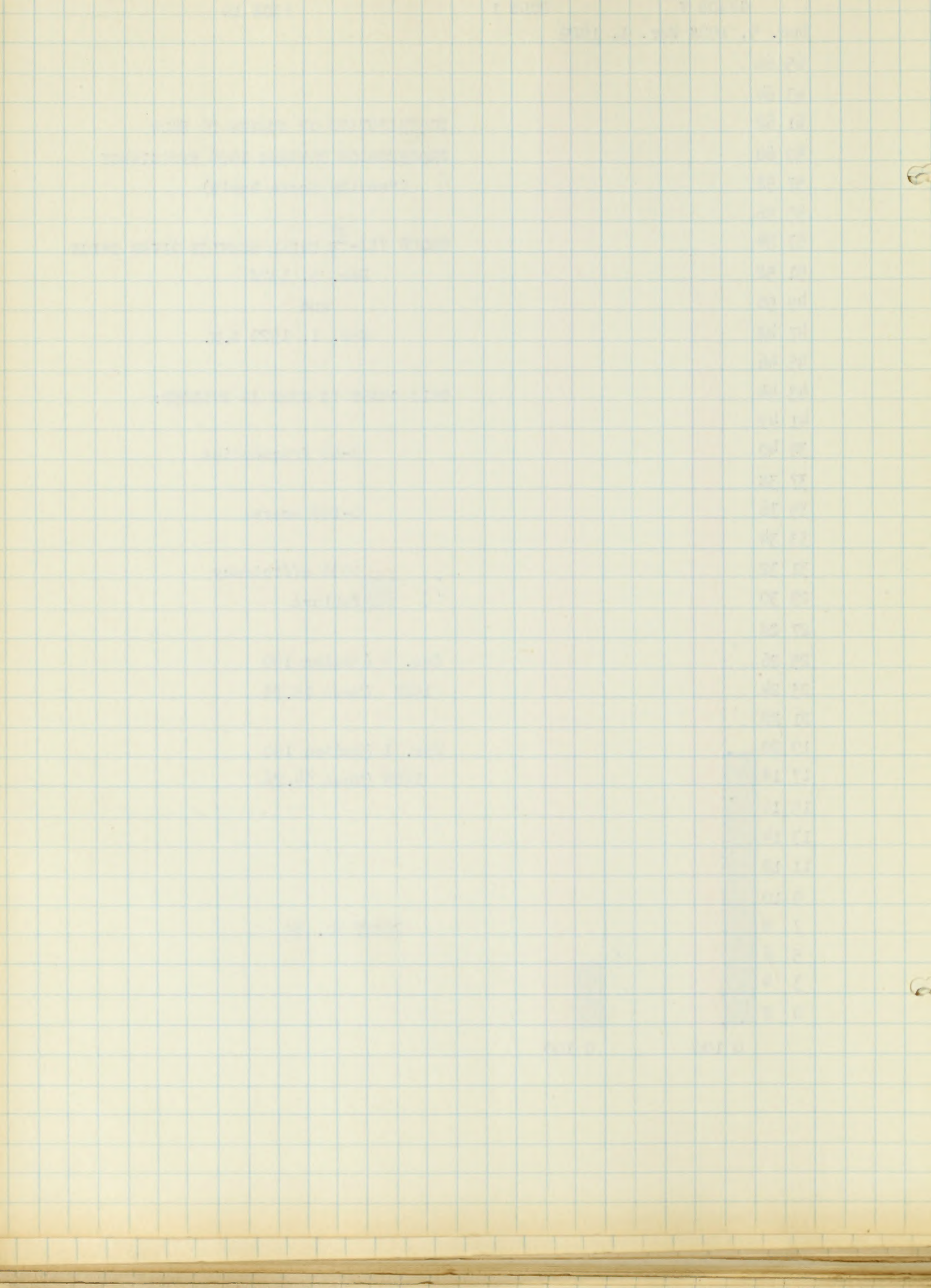
1928 (Mean 74.2%

Mar. 1 (Median 100

1929 (Mean 94.2%

CHART NO. 58







GRADE VI

RULE I

Page 17

Dec. 6, 1928 Mar. 1, 1929

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP VII- $\frac{24}{3}$  DRILL SERVICE GIVEN TWICE  
Dec. 6, 1928  
and  
Mar. 1, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

0-64 frequencies

0-100 score

100% efficiency

failure

Dec. 6 (Median 100

1928 (Mean 62.8%)

Mar. 1 (Median 100

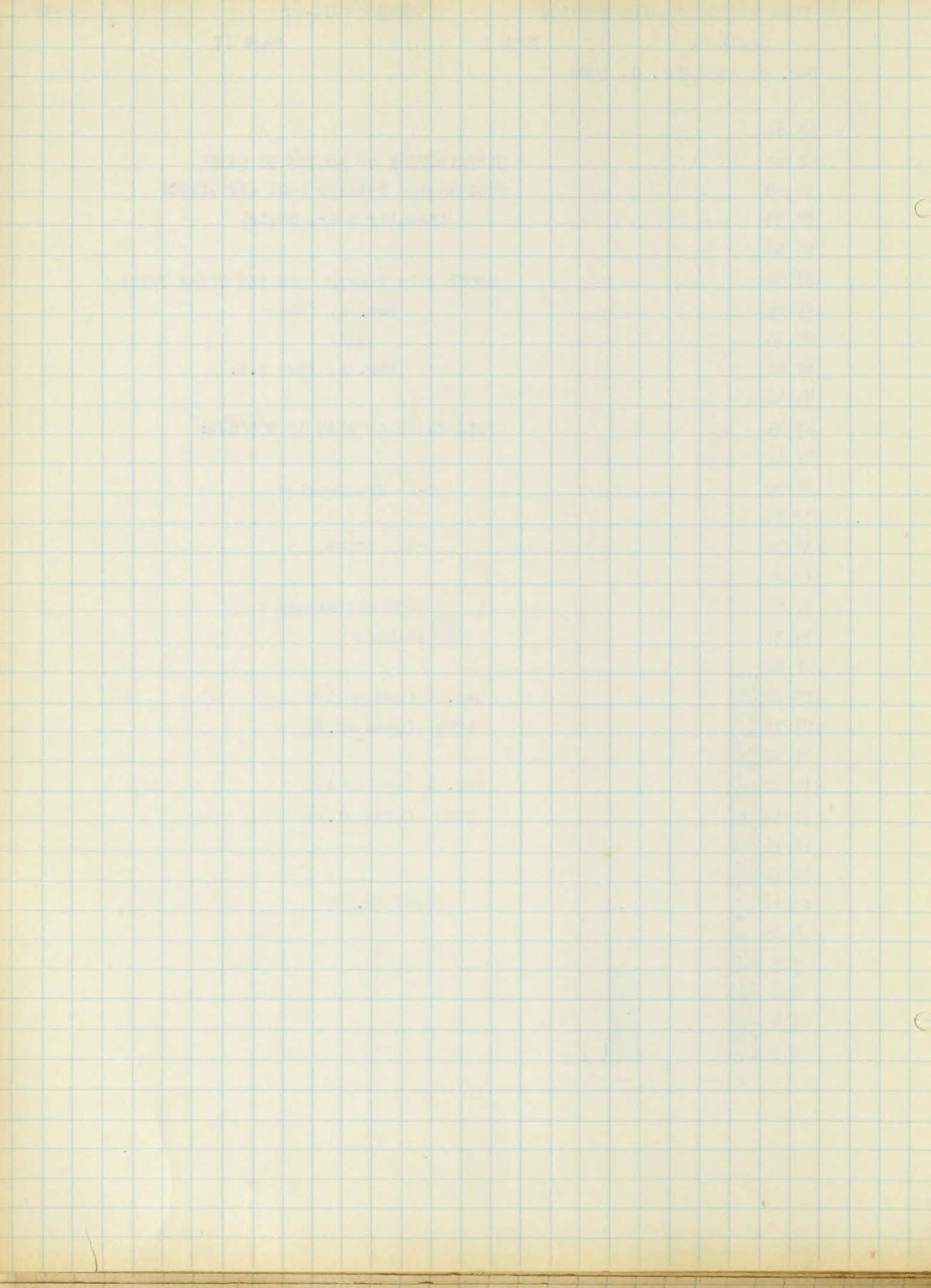
1929 (MEAN 91.4%)

CHART NO. 59

0 100

0 100







GRADE V

RULE I

PAGE 17

67 68  
65 66  
63 64  
61 62  
59 60  
57 58  
55 56  
53 54  
51 52  
49 50  
47 48  
45 46  
43 44  
41 42  
39 40  
37 38  
35 36  
33 34  
31 32  
29 30  
27 28  
25 26  
23 24  
21 22  
19 20  
17 18  
15 16  
13 14  
11 12  
9 10  
7 8  
5 6  
3 4  
0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW PROGRESSION  
TOWARDS 100% EFFICIENCY (Penalty Score Basis)

GROUP VIII-<sup>25</sup>/<sub>1</sub> DRILL SERVICE GIVEN TWICE  
Dec. 7, 1928  
and  
Mar. 4, 1929 A.M.

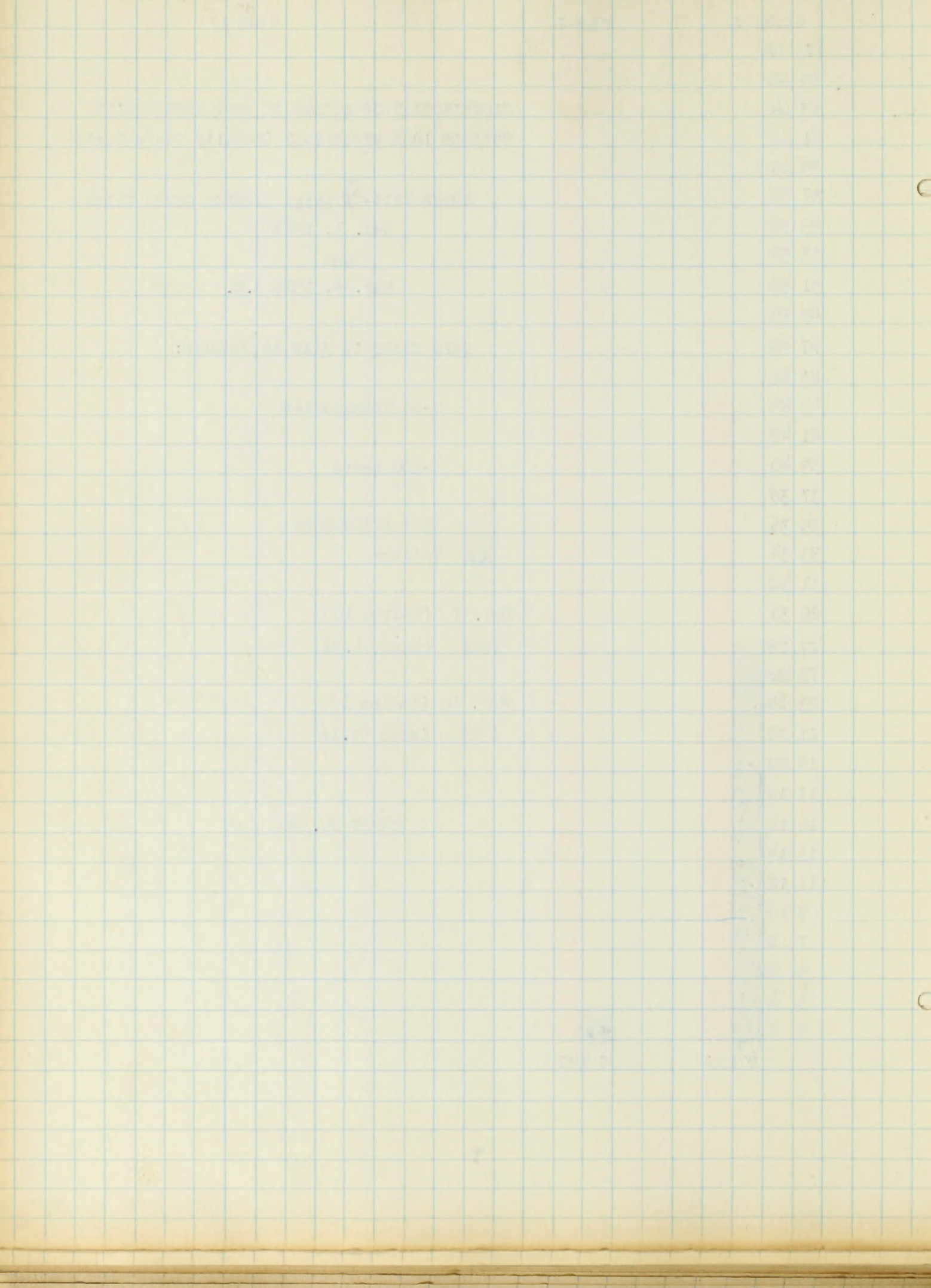
THIS CHART IS READ AS FOLLOWS:

0-68 frequencies  
0-100 score  
100% efficiency  
failure

Dec. 7 (Median 100  
1928 (Mean 61.4%)  
Mar. 4 (Median 100  
1929 (Mean 97.1%)

CHART NO. 60







GRADE V

RULE I

PAGE 17

Dec. 10, 1928 Mar. 4, 1929

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW

PROGRESSION TOWARDS 100% EFFICIENCY

(Penalty Score Basis)

GROUP VIII- $\frac{25}{2}$  DRILL SERVICE GIVEN TWICE

Dec. 10, 1928

and

Mar. 4, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

0-68 frequencies

0-100 score

100% efficiency

failure

Dec. 10 (Median 100

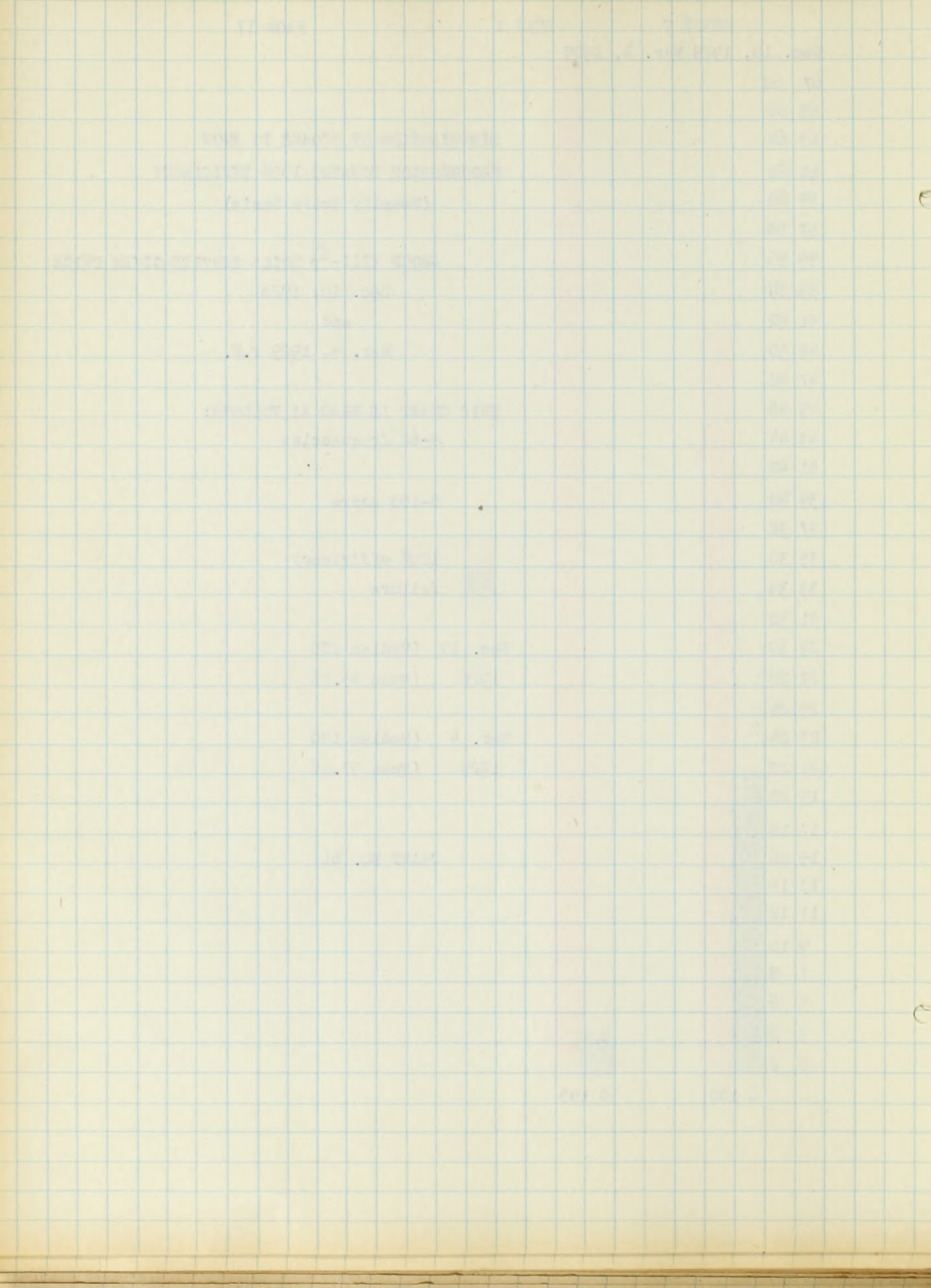
1928 (Mean 85.7%

Mar. 4 (Median 100

1929 (Mean 97.1%

CHART NO. 61







LONG DIVISION DRILL SERVICE

GROUP IX-  $\frac{26}{1}$

GRADE V

RULE I

PAGE 17

Dec. 11, 1928 Mar. 5, 1929

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

(Penalty Score Basis)

GROUP VIII- $\frac{25}{2}$  DRILL SERVICE GIVEN TWICE

Dec. 11, 1928

and

Mar. 5, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

0-66 frequencies

0-100 score

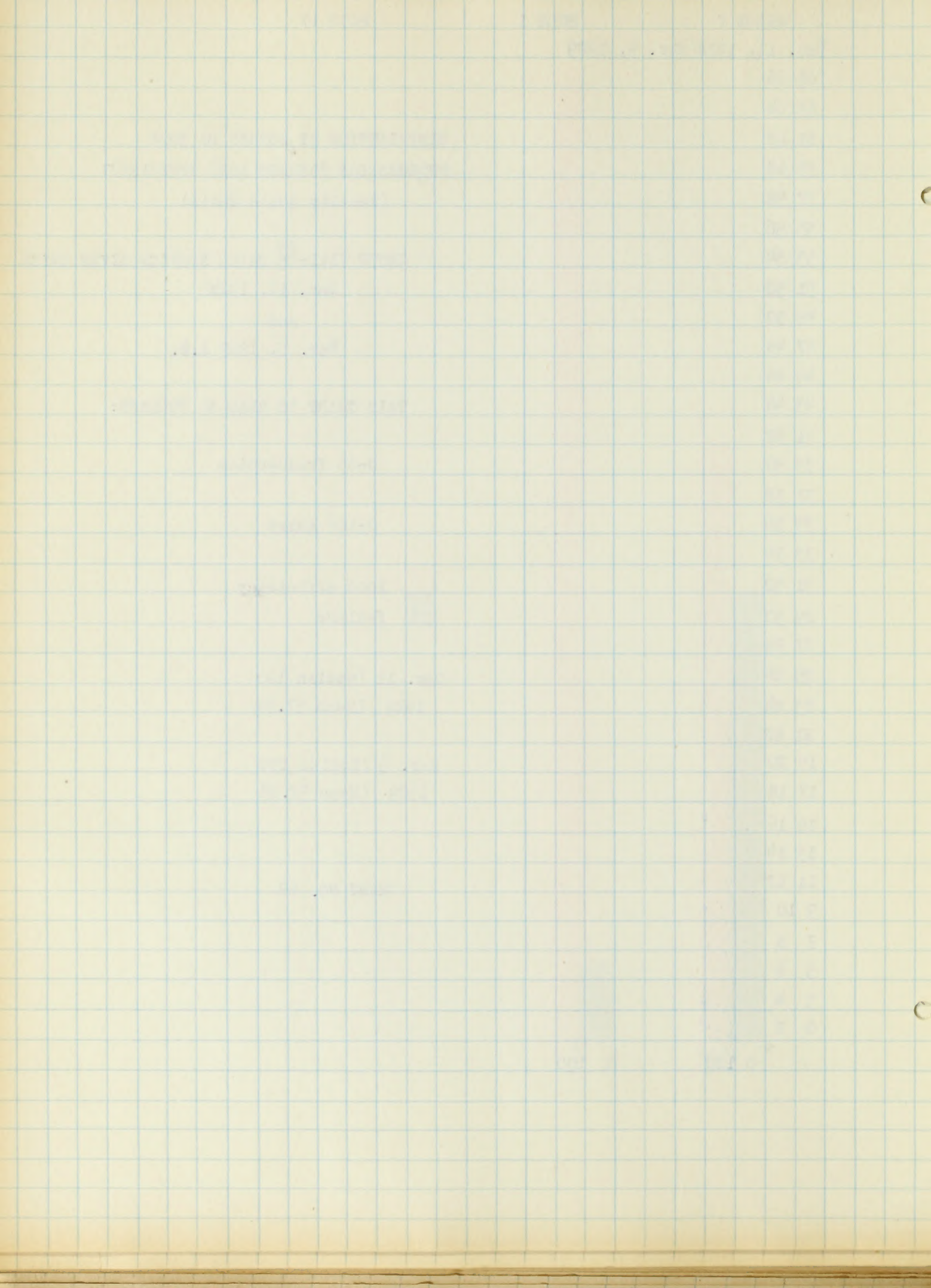
100% efficiency  
failure

Dec. 11 (Median 100  
1928 (Mean 57.5%)

Mar. 5 (Median 100  
1929 (Mean 92.8%)

CHART NO. 62







GRADE V

RULE I

PAGE 19

Dec. 12, 1928 Mar. 5, 1929

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

(Penalty Score Basis)

GROUP IX- $\frac{26}{1}$  DRILL SERVICE GIVEN TWICE

Dec. 12, 1928

and

Mar. 5, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

0-68 frequencies

0-100 score

100% efficiency

failure

Dec. 12 (Median 100

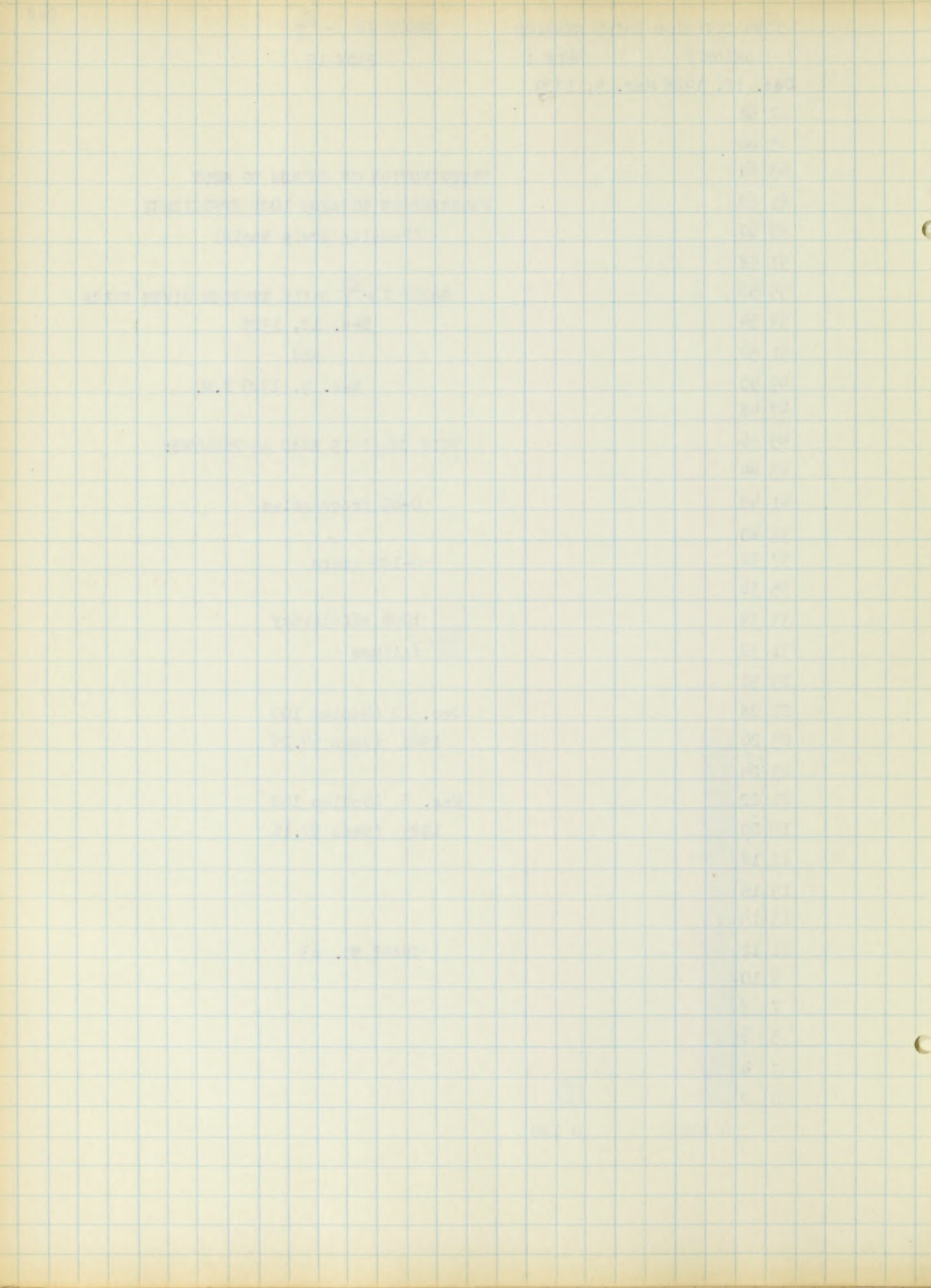
1928 (Mean 64.2%)

Mar. 5 (Median 100

1929 (Mean 97.1%)

CHART NO. 63







LONG DIVISION DRILL SERVICE

GROUP IX-<sup>26</sup>/<sub>3</sub>

GRADE V

RULE I

PAGE 19

Dec. 13, 1928 Mar. 6, 1929

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP IX-<sup>26</sup>/<sub>2</sub> DRILL SERVICE GIVEN TWICE  
Dec. 13, 1928  
and  
Mar. 6, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

0-66 frequencies

0-100 score

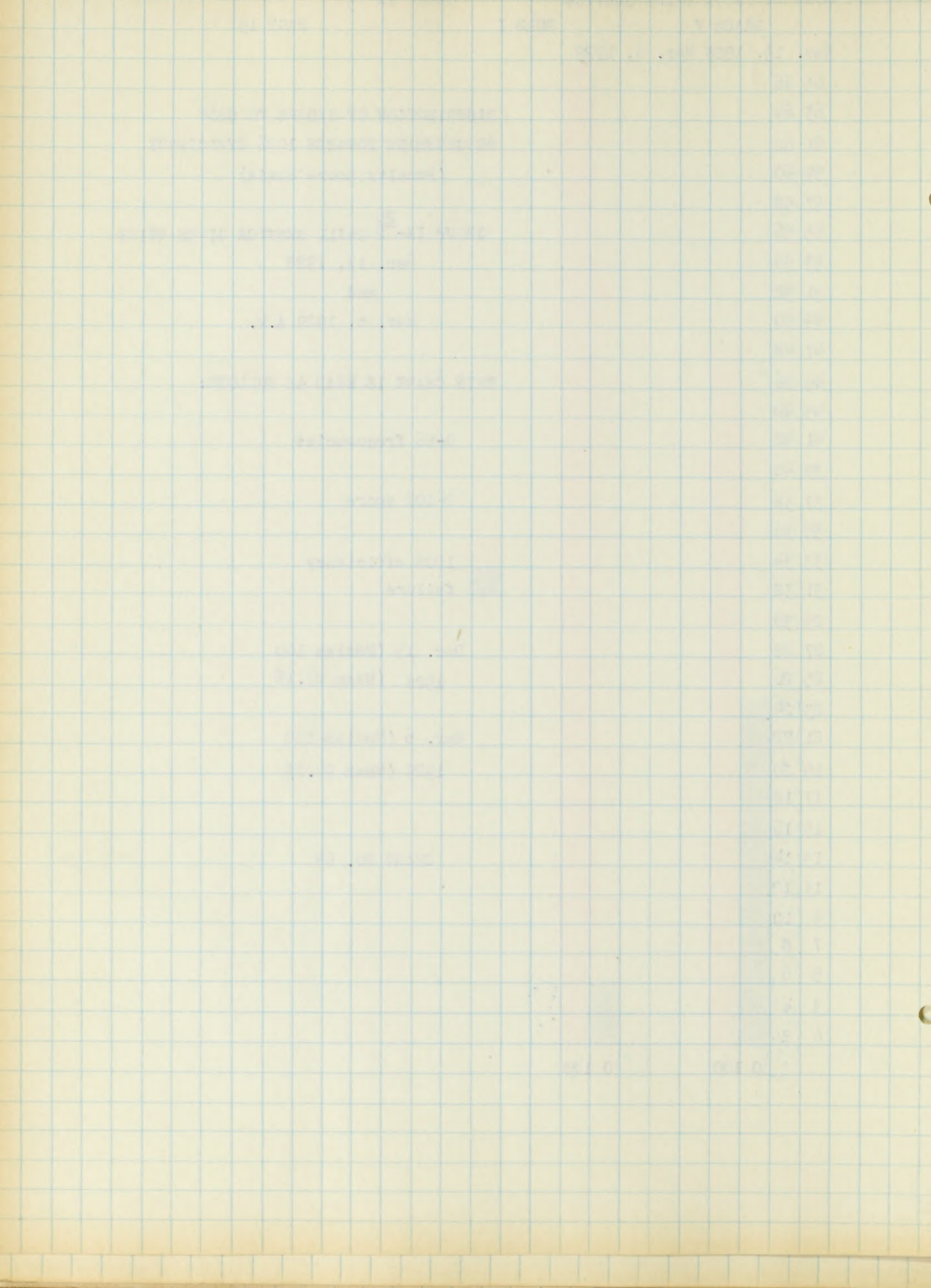
100% efficiency  
failure

Dec. 13 (Median 100  
1928 (Mean 67.1%

Mar. 6 (Median 100  
1929 (Mean 94.2%

CHART NO. 64







GRADE V

RULE I EXCEPTIONS

PAGE 21

Dec. 14, 1928 Mar. 6, 1929

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP IX-  $\frac{26}{2}$  DRILL SERVICE GIVEN TWICE

Dec. 14, 1928

and

Mar. 6, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

0-68 frequencies

0-100 score

100% efficiency

failure

Dec. 14 (Median 100  
1928 (Mean 61.4%)

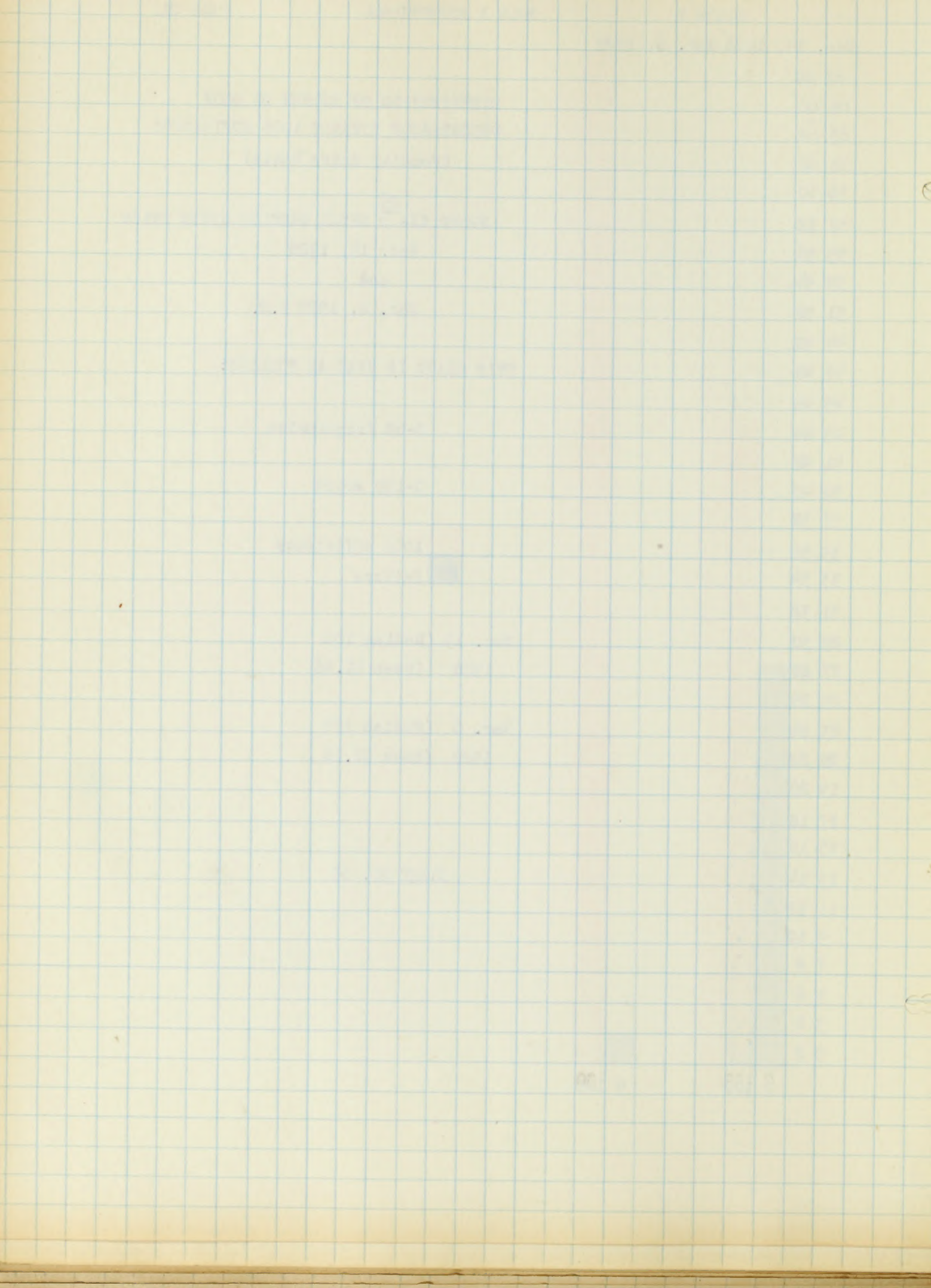
Mar. 6 (Median 100  
1929 (Mean 97.1%)

CHART NO. 65

0 100

0 100







LONG DIVISION DRILL SERVICE GROUP IX- $\frac{27}{2}$ 

GRADE V

RULE I Exceptions

Page 21

Dec. 18, 1928 Mar. 7, 1929

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP IX- $\frac{27}{2}$  EXCEPTIONS  
DRILL SERVICE GIVEN TWICE

Dec. 18, 1928

and

Mar. 7, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency  
failure

Dec. 18 (Median 100  
1928 (Mean 65.7%)

Mar. 7 (Median 100  
1929 (Mean 98.5%)

CHART NO. 66

0 / 100

0 / 100







GRADE V

RULE II

PAGE 23

Dec. 19, 1928 Mar. 8, 1929

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO

SHOW PROGRESSION TOWARDS 100% EFFICIENCY

(Penalty Score Basis)

GROUP X- $\frac{28}{1}$  DRILL SERVICE GIVEN TWICE

Dec. 19, 1928

and

Mar. 8, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

0-68 frequencies

0-100 score

100% efficiency

failure

Dec. 19 (Median 100

1928 (Mean 71.4%)

Mar. 8 (Median 100

1929 (Mean 97.1%)

CHART NO. 67







59 60  
57 58  
55 56  
53 54  
51 52  
49 50  
47 48  
45 46  
43 44  
41 42  
39 40  
37 38  
35 36  
33 34  
31 32  
29 30  
27 28  
25 26  
23 24  
21 22  
19 20  
17 18  
15 16  
13 14  
11 12  
9 10  
7 8  
5 6  
3 4  
0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP X- $\frac{28}{2}$  DRILL SERVICE GIVEN TWICE  
Dec. 20, 1928  
and  
Mar. 8, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

0-60 frequencies

0-100 score

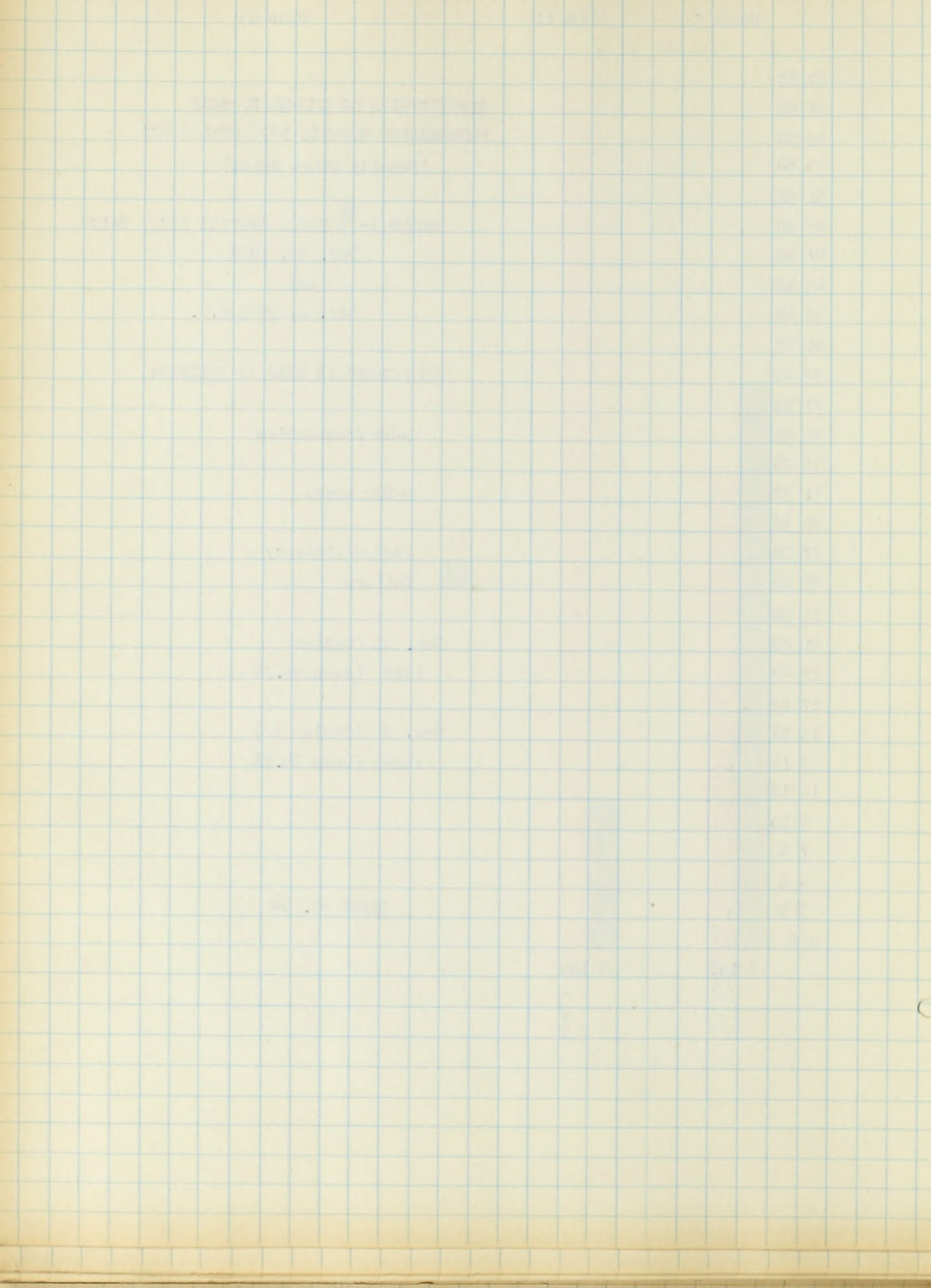
100% efficiency  
failure

Dec. 20 (Median  
1928 (Mean 45.7%

Mar. 8 (Median 100  
1929 (Mean 85.7%

CHART NO. 68







## LONG DIVISION DRILL SERVICE

GROUP X-29

GRADE V

RULE II

PAGE 24

Dec. 21, 1928 Mar. 11, 1929

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

(Penalty Score Basis)

GROUP X-29 DRILL SERVICE GIVEN TWICE

Dec. 21, 1928

and

Mar. 11, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

0-66 frequencies

0-100 score

100% efficiency

failure

Dec. 21 (Median 100

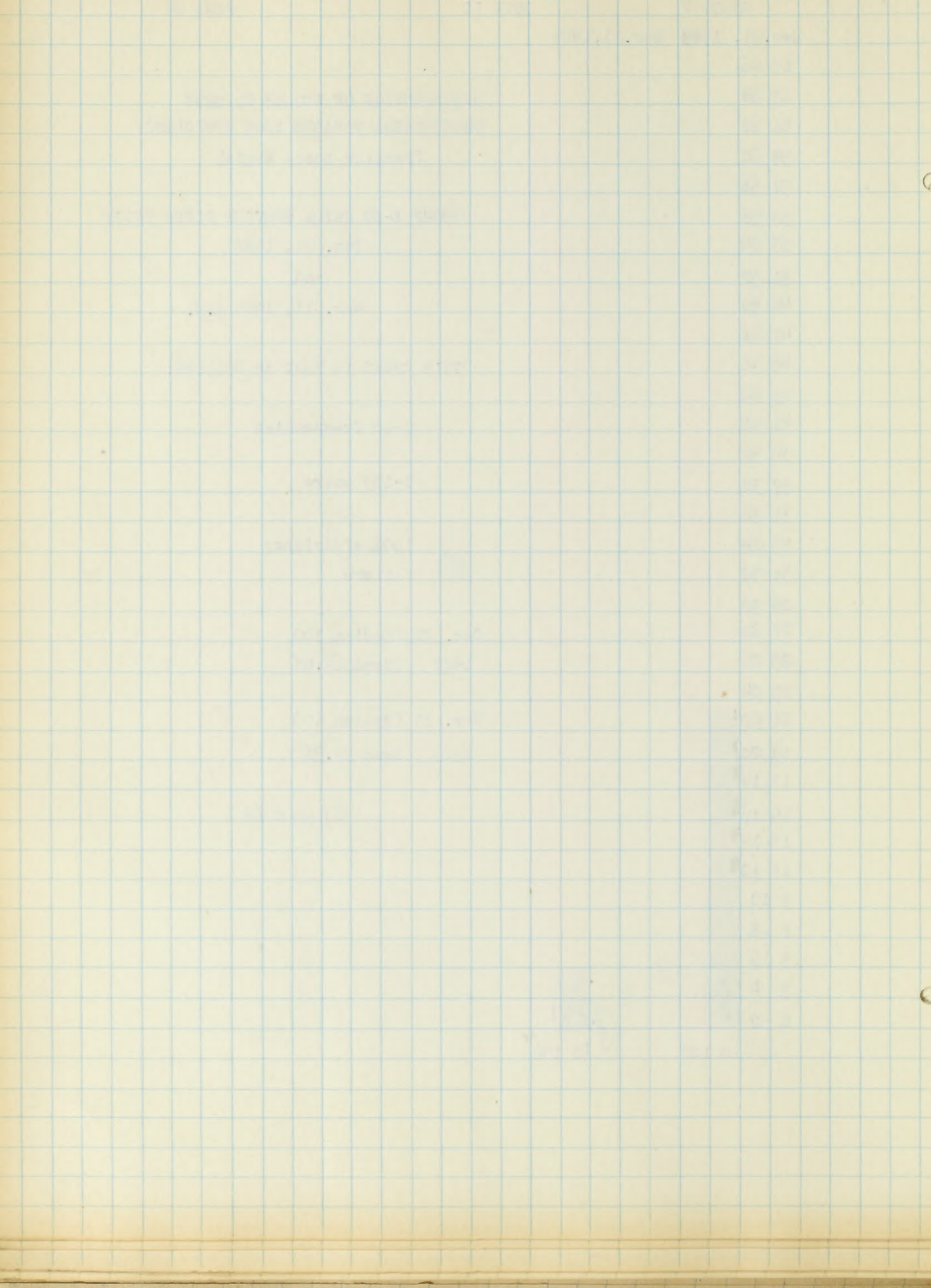
1928 (Mean 68.0%)

Mar. 11 (Median 100

1929 (Mean 94.3%)

Chart 69.







LONG DIVISION DRILL SERVICE

GROUP X- $\frac{30}{1}$ 

GRADE V

RULE II

PAGE 24

DISTRIBUTION OF SCORES TO SHOW PROGRESSION TOWARDS 100% EFFICIENCY

Jan. 2, 1929    Mar. 11, 1929

(Penalty Score Basis)

65 66  
 63 64  
 61 62  
 59 60  
 57 58  
 55 56  
 53 54  
 51 52  
 49 50  
 47 48  
 45 46  
 43 44  
 41 42  
 39 40  
 37 38  
 35 36  
 33 34  
 31 32  
 29 30  
 27 28  
 25 26  
 23 24  
 21 22  
 19 20  
 17 18  
 15 16  
 13 14  
 11 12  
 9 10  
 7 8  
 5 6  
 3 4  
 0 2

0 100

0 100

GROUP X- $\frac{30}{1}$  DRILL SERVICE GIVEN TWICE  
 Jan. 2, 1929  
 and  
 Mar. 11, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

0-66 frequencies

0-100 score

100% efficiency

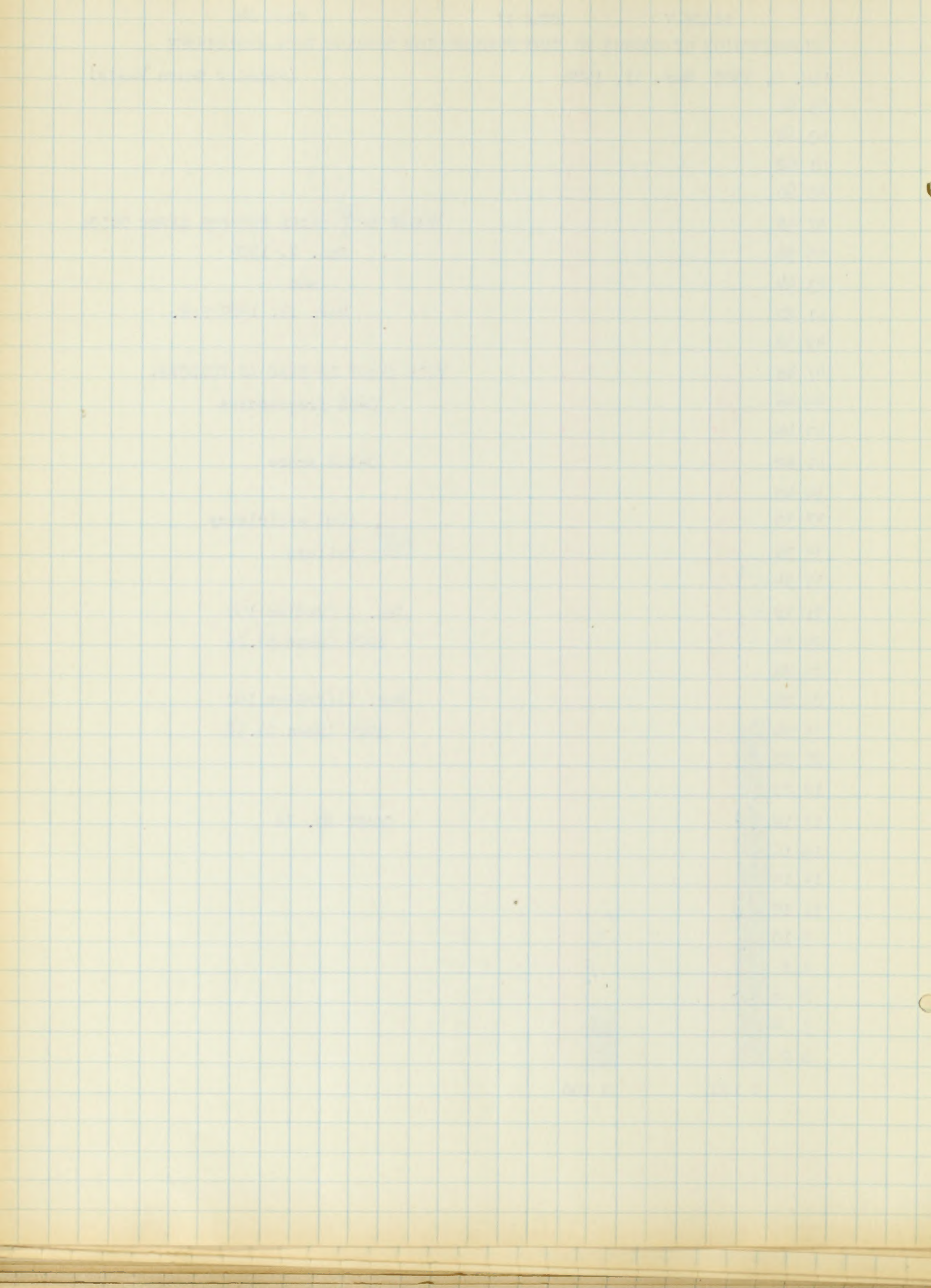
failure

Jan. 2 (Median 100  
 1929 (Mean 67.1%)

Mar. 11 (Median 100  
 1929 (Mean 94.3%)

CHART NO. 70







## LONG DIVISION DRILL SERVICE

GROUP X- $\frac{30}{2}$ 

GRADE V

RULE II

PAGE 24

Jan. 3, 1928 Mar. 12, 1929

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

(Penalty Score Basis)

GROUP X- $\frac{30}{2}$  DRILL SERVICE GIVEN TWICE

Jan. 3, 1929

and

Mar. 12, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

0-64 frequencies

0-100 score

100% efficiency

failure

Jan. 3 (Median 100

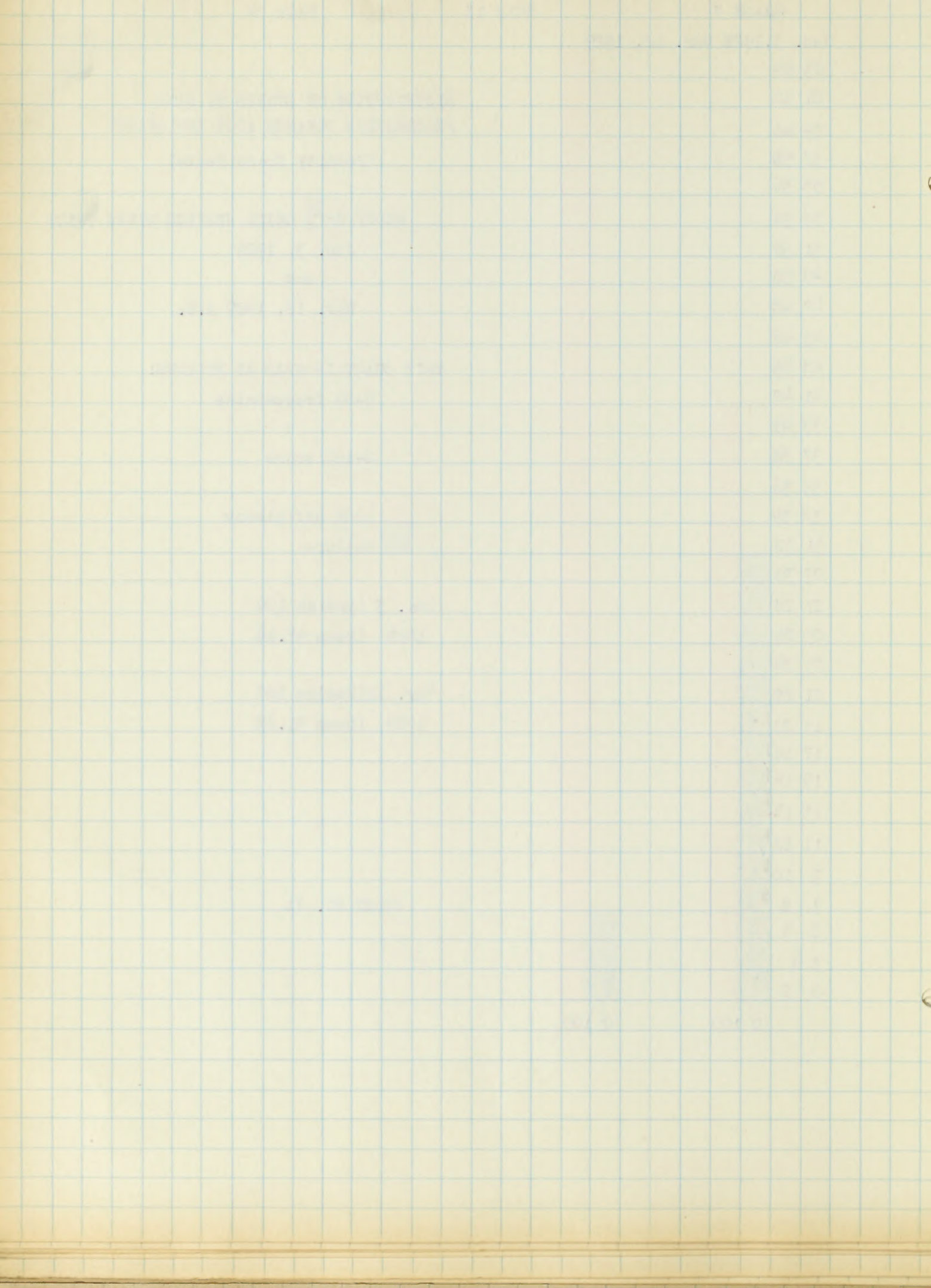
1929 (Mean 57.1%

Mar. 12 (Median 100

1929 (Mean 91.6%

CHART NO. 71







GRADE V

RULE II

PAGE 25

Jan. 4, 1929 Mar. 12, 1929

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 1

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP X- $\frac{31}{1}$  DRILL SERVICE GIVEN TWICE  
Jan. 4, 1929  
and  
Mar. 12, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

0-66 frequencies

0-100 score

100% efficiency

failure

Jan. 4 (Median 100  
1929 (Mean 64.2%)

Mar. 12 (Median 100  
1929 (Mean 94.3%)

CHART No. 72







## LONG DIVISION DRILL SERVICE

GROUP X- $\frac{31}{2}$ 

GRADE V

RULE II

PAGE 25

Jan. 7, 1929 Mar. 13, 1929

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP X- $\frac{31}{2}$  DRILL SERVICE GIVEN TWICE  
Jan. 7, 1929  
and  
Mar. 13, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

0-66 frequencies

0-100 score

100% efficiency  
failure

Jan. 7 (Median 100  
1929 (Mean 68.5%)

Mar. 13 (Median 100  
1929 (Mean 94.3%)

CHART NO. 73



THE UNIVERSITY OF CHICAGO  
LIBRARY OF THE DIVISION OF THE PHYSICAL SCIENCES  
(1954-1955)

RECEIVED FROM THE  
LIBRARY OF THE DIVISION OF THE PHYSICAL SCIENCES  
ON 10/10/55

THE UNIVERSITY OF CHICAGO

LIBRARY OF THE DIVISION OF THE PHYSICAL SCIENCES

1954-1955

LIBRARY OF THE DIVISION OF THE PHYSICAL SCIENCES

1954-1955

LIBRARY OF THE DIVISION OF THE PHYSICAL SCIENCES

1954-1955

LIBRARY OF THE DIVISION OF THE PHYSICAL SCIENCES

1954-1955

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1954-1955

LIBRARY OF THE DIVISION OF THE PHYSICAL SCIENCES

1954-1955

LIBRARY OF THE DIVISION OF THE PHYSICAL SCIENCES

1954-1955



## LONG DIVISION DRILL SERVICE

GROUP X-32

GRADE V

RULE II Exceptions

Page 27

Jan. 8, 1929 Mar. 13, 1929

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP X-32 DRILL SERVICE GIVEN TWICE

Jan. 8, 1929

and

Mar. 13, 1929

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency

failure

Jan. 8 (Median 100

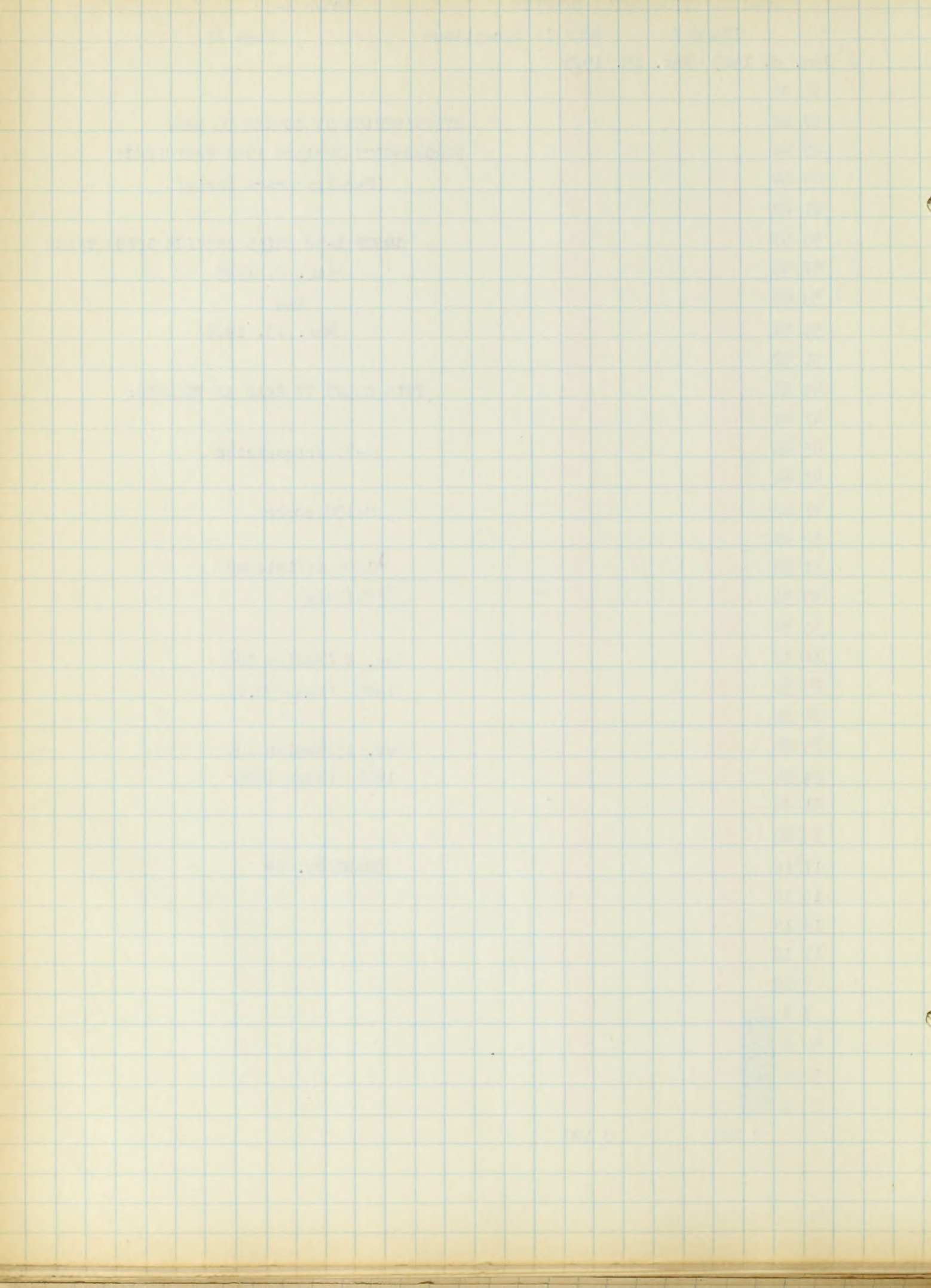
1929 (Mean 90.0%)

Mar. 13 (Median 100

1929 (Mean 100%)

CHART NO. 74







## LONG DIVISION DRILL SERVICE

GROUP X-33

GRADE V

RULE II-Exceptions

Page 28

Jan. 9, 1929 Mar. 14, 1929

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP X-33 DRILL SERVICE GIVEN TWICE

Jan. 9, 1929

and

Mar. 14, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

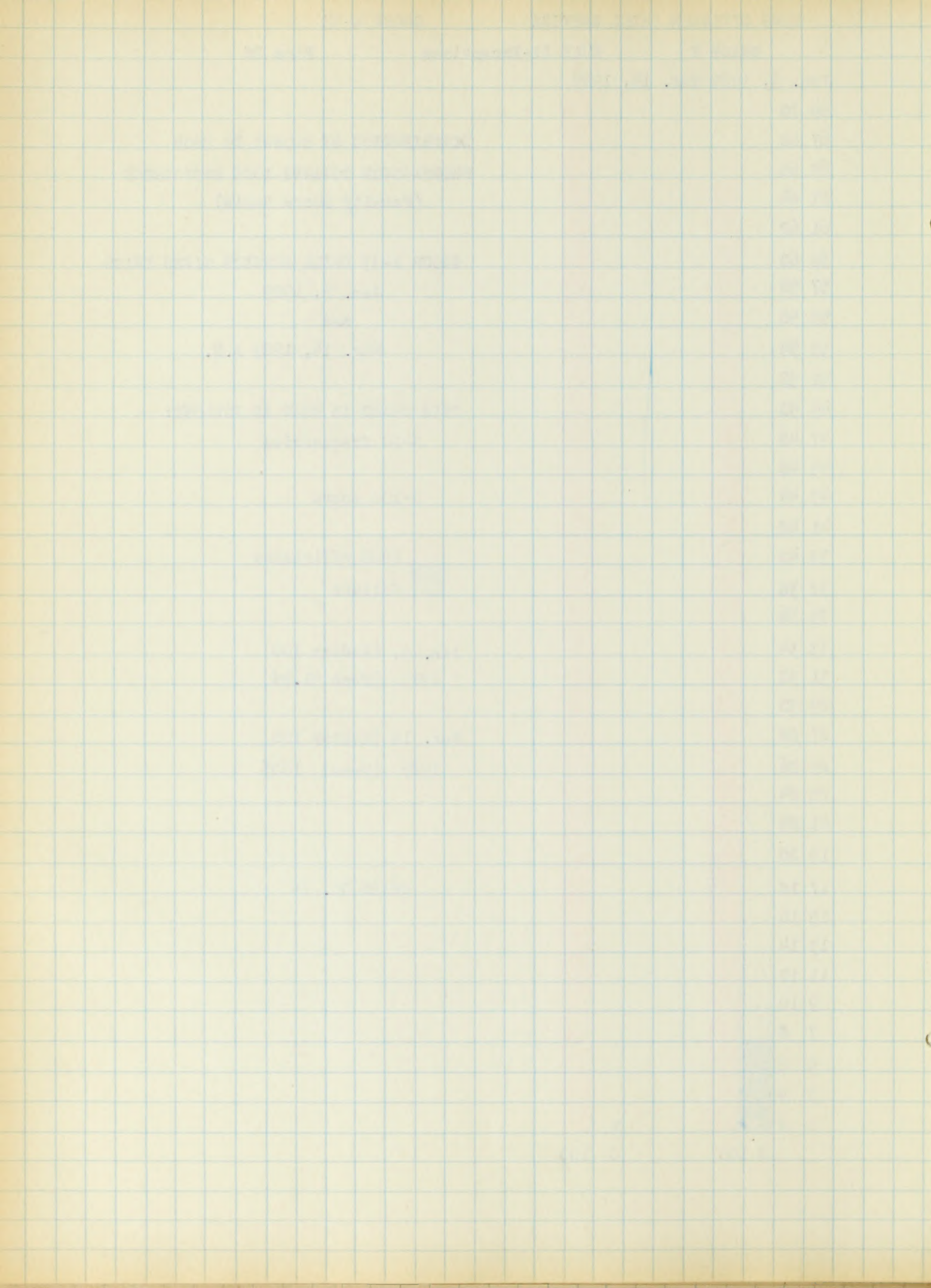
100% efficiency  
failure

Jan. 9, (Median 100  
1929 (Mean 91.4%)

Mar. 14 (Median 100  
1929 (Mean 100%)

CHART NO. 75







Jan. 10, 1929 Mar. 14, 1929

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP X- $\frac{34}{1}$  DRILL SERVICE GIVEN TWICE  
Jan. 10, 1929  
and  
Mar. 14, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% frequencies  
failures

Jan. 10 (Median 100  
1929 (Mean 68.5%)

Mar. 14 (Median 100  
1929 (Mean 98.5%)

CHART NO. 76







## LONG DIVISION DRILL SERVICE

GROUP X-  $\frac{34}{2}$ 

GRADE V

RULE II

Exception

Page 29

Jan. 11, 1929 Mar. 15, 1929

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP X-  $\frac{34}{2}$  DRILL SERVICE GIVEN TWICE

Jan. 11, 1929

and

Mar. 15, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

0-68 frequencies

0-100 score

100% efficiency

failure

Jan. 11 (Median 100

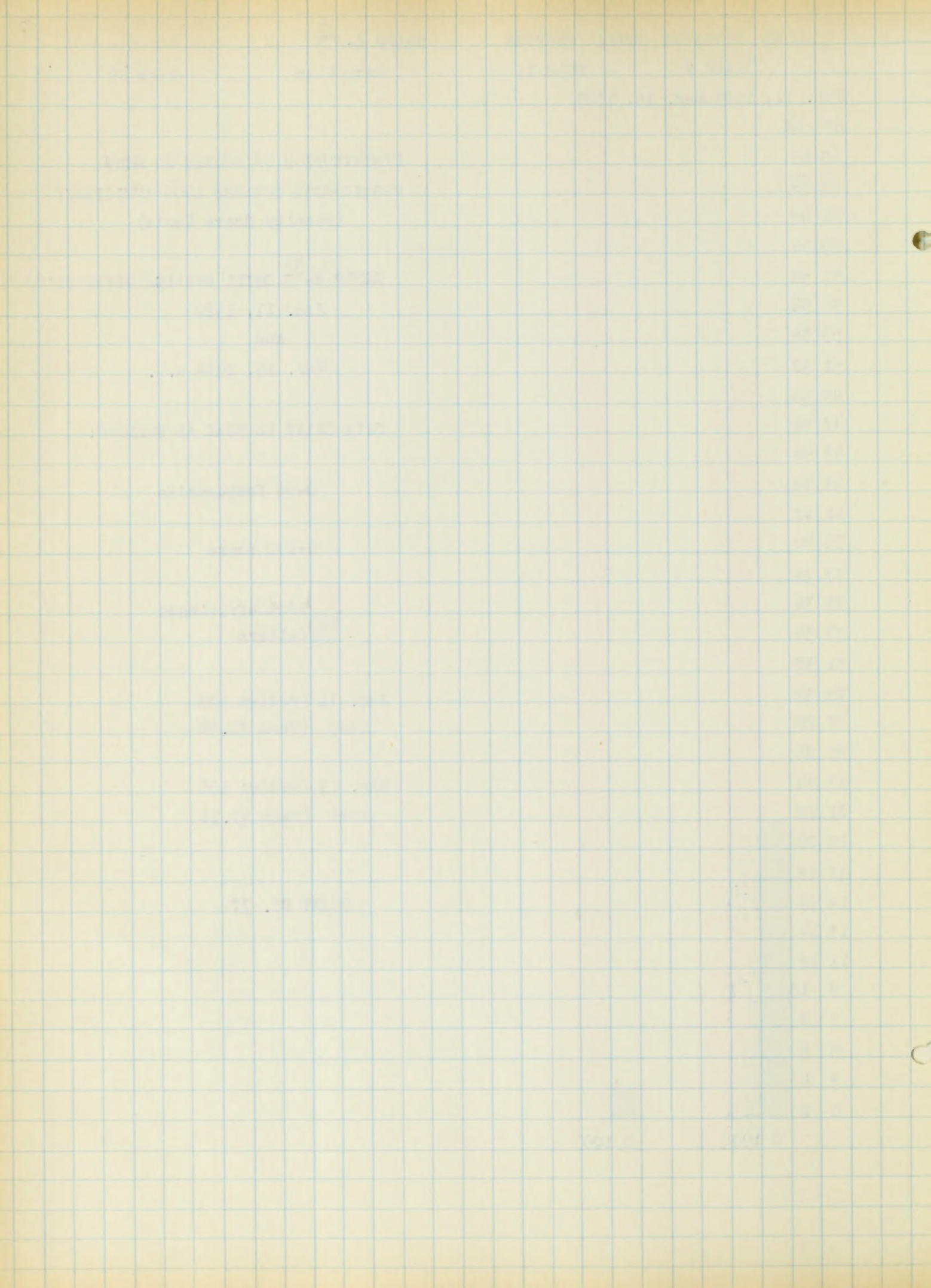
1929 (Mean 71.4%)

Mar. 15 (Median 100

1929 (Mean 97.1%)

CHART NO. 77







## LONG DIVISION DRILL SERVICE

GROUP X-35

GRADE V

RULE II- Exceptions

Page 30

Jan. 14, 1929 Mar. 15, 1929

69 70

67 68

65 66

63 64

61 62

59 60

57 58

55 56

53 54

51 52

49 50

47 48

45 46

43 44

41 42

39 40

37 38

35 36

33 34

31 32

29 30

27 28

25 26

23 24

21 22

19 20

17 18

15 16

13 14

11 12

9 10

7 8

5 6

3 4

0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP X- 35 DRILL SERVICE GIVEN TWICE

Jan. 14, 1929

and

Mar. 15, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

0-70 frequencies

0-100 score

100% efficiency  
failure

Jan. 14 (Median 100

1929 (Mean 70%)

Mar. 15 (Median 100

1929 (Mean 98.5%)

CHART NO. 78







LONG DIVISION DRILL SERVICE

GROUP X- 36

GRADE V

RULE II Exceptions

Page 30

Jan. 15, 1929

Mar. 18, 1929

63 64  
61 62  
59 60  
57 58  
55 56  
53 54  
51 52  
49 50  
47 48  
45 46  
43 44  
41 42  
39 40  
37 38  
35 36  
33 34  
31 32  
29 30  
27 28  
25 26  
23 24  
21 22  
19 20  
17 18  
15 16  
13 14  
11 12  
9 10  
7 8  
5 6  
3 4  
0 2

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
(Penalty Score Basis)

GROUP X-36 DRILL SERVICE GIVEN TWICE

Jan. 15, 1929

and

Mar. 18, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

0-64 frequencies

0-100 score

100% efficiency

failure

Jan. 15 (Median

1929 (Mean 41.4%)

Mar. 18 (Median 100

1929 (Mean 91.4%)

CHART NO. 79



RECEIVED

RECEIVED

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CHART NO. 80

GRADE V - 70 Pupils

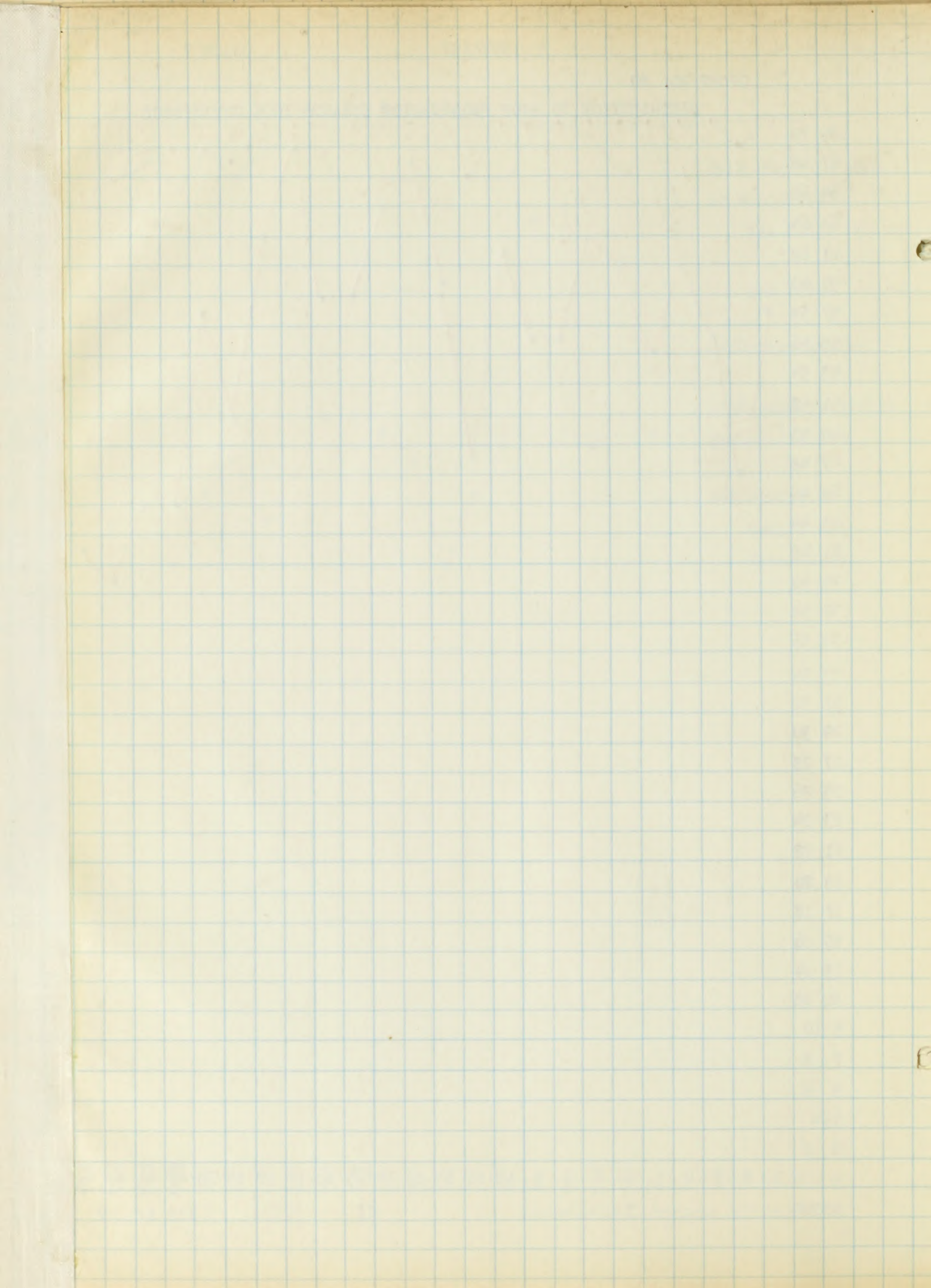
SUMMARY

DISTRIBUTION OF SCORE TO SHOW

PROGRESSION TOWARDS 100% EFFICIENCY

ON FIRST TRIAL AND SECOND TRIAL







I. SUMMARIZED RESULTS IN TERMS OF MEDIAN AND MEANS

TO SHOW PROGRESSION IN LONG DIVISION DRILL

SERVICE - FIRST AND SECOND TRIAL - GRADE V -

(See Table No. XIX)

II. SUMMARIZED RESULTS TO SHOW BY GROUPS GAINED

PROGRESSION IN MEDIAN AND MEAN - GRADE VI

(See Table No. XX)

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THE UNIVERSITY OF CHICAGO PRESS

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THE UNIVERSITY OF CHICAGO PRESS



## LONG DIVISION DRILL SERVICE TABLE NO. XIX

## SHOWING PROGRESSION IN THE MEDIAN AND MEAN

(See Charts No. 29-80)

		GRADE V												
		I										II		
		1	2	3	4	5	6	7	8	9	10	1	2	3
Trial	(Median	100	100	100	100	100	100	100	100	100	100	100	100	100
I	(Mean	81.5	68.6	78.5	85.7	77.1	85.7	94.2	81.4	81.4	87.1	67.1	84.2	95.7
Trial	(Median	100	100	100	100	100	100	100	100	100	100	100	100	100
II	(Mean	100	97.1	100	100	100	100	100	100	100	100	94.2	100	100

Group		II							III	IV	V	VI		
Set		4	5	6	7	8	9	10	$\frac{21}{1}$	$\frac{21}{2}$	$\frac{22}{1}$	$\frac{22}{2}$	$\frac{23}{1}$	$\frac{23}{2}$
Trial	(Median	100	100	100	100	100	100	100	100	100	100	100	100	----
I	(Mean	91.4	82.7	82.7	97.1	87.5	71.4	81.4	62.8	62.8	98.5	58.5	61.4	38.5
Trial	(Median	100	100	100	100	100	100	100	100	100	100	100	100	100
II	(Mean	100	100	100	100	100	95.7	97.1	97.1	95.7	94.2	92.8	97.1	82.8

		VI										VII			VIII			IX			Exception			X
		23	24	24	24	25	25	25	26	26	26	27	27	28	25	25	25	26	26	26	27	27	28	28
		3	1	2	3	1	2	3	1	2	3	1	2	1	1	2	3	1	2	3	1	2	1	1
Trial	(Median	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
I	(Mean	57.5	64.2	51.4	74.2	62.8	61.4	85.7	57.5	64.2	67.1	61.4	65.7	71.4										
Trial	(Median	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
II	(Mean	91.4	97.1	85.7	94.2	91.4	97.1	97.1	92.8	97.1	94.2	97.1	98.5	97.1										

		X												
		28	29	30	30	31	31	32	33	34	34	35	36	
		2	1	2	1	2	2	3	1	2	2	1	2	
Trial	(Median	----	100	100	100	100	100	100	100	100	100	100	100	----
I	(Mean	45.7	68.0	67.1	57.1	64.2	68.5	90.	91.4	68.5	71.4	70.	41.4	
Trial	(Median	100	100	100	100	100	100	100	100	100	100	100	100	
II	(Mean	85.7	94.3	94.3	91.6	94.3	94.3	100	100	98.5	97.1	98.5	91.4	





T A B L E N O X X

SUMMARIZED RESULTS SHOWING BY GROUPS GAINED PROGRESSION IN THE

MEDIAN AND MEAN

(See Charts No. 29-30)

GRADE V

Group	M E D I A N			:	M E A N		
	1st Trial	2nd Trial	Gain		1st Trial	2nd Trial	Gain
I	100	100	---	:	82.1%	99.7%	7.6%
II	100	100	---	:	84.1%	98.7%	14.6%
III	100	100	---	:	62.8%	97.1%	34.3%
IV	100	100	---	:	62.8%	95.7%	32.9%
V	100	100	---	:	78.5%	93.5%	15.0%
VI	0	100	100	:	52.5%	90.4%	37.9%
VII	100	100	---	:	63.2%	92.3%	29.1%
VIII	100	100	---	:	69.9%	95.2%	25.3%
IX	100	100	---	:	62.9%	93.7%	30.8%
Exceptions	100	100	---	:	68.5%	97.8%	29.3%
X	0	100	100	:	63.1%	93.1%	30. %
Exceptions	0	100	100	:	72.1%	97.6%	25.5%





G R A D E V I





[illegible]

Key ✓ - 100 Figure-number of errors a- absent a ✓ - 100 I-X Groups I-  
 $\frac{1}{2}$  - 2d trial, corrected errors 3 - corrected error  $\frac{2}{a}$  - absent, corrected errors

VII	VIII	IX	Excep- tions	Median of errors-12	Exceptions 487 examples in drill
-----	------	----	-----------------	---------------------	-------------------------------------







INDIVIDUAL'S EFFICIENCYRECORD AND CHARTTABLE NO. 22





✓ - 1st trial  
✓ - corrected -

266

Bruce Chiffard October 24, 1923. Grade 6 B.  
100 % Efficiency

Group 1, 100 ✓	Group 22, <del>100</del> 116, 533921 ✓	Group 22, 100 ✓
Group 2, 100 ✓	Group 23, 100 ✓	Group 33, 100 ✓
Group 3, 100 ✓	Group 24, 100 ✓	Group $\frac{34}{1}$ , 100 ✓
Group 4, 100 ✓	Group 25, 100 ✓	Group $\frac{34}{2}$ , 100 ✓
Group 5, 100 ✓	Group $\frac{26}{1}$ , 100 ✓	Group 35, 100 ✓
Group 6, 100 ✓	Group $\frac{26}{2}$ , 100 ✓	Group 36, 100 ✓
Group 7, 100 ✓	Group $\frac{26}{3}$ , 100 ✓	
Group 8, 100 ✓	Group $\frac{27}{1}$ , 100 ✓	
Group 9, 100 ✓	Group $\frac{27}{2}$ , 100 ✓	
Group 10, 100 ✓	Group $\frac{28}{1}$ , <del>100</del> 24112 ✓	Group $\frac{28}{1}$ , 100 ✓
Group 11, 100 ✓	Group $\frac{28}{1}$ , 100 ✓	
Group 12, 100 ✓	Group $\frac{28}{2}$ , 100 ✓	
Group 13, 100 ✓	Group $\frac{28}{3}$ , <del>100</del> 9200 ✓	
Group 14, 100 ✓	Group 29, 100 ✓	
Group 15, 100 ✓	Group $\frac{30}{1}$ , 100 ✓	
Group 16, 100 ✓	Group $\frac{30}{2}$ , 100 ✓	
Group 17, 100 ✓	Group $\frac{31}{1}$ , 100 ✓	
Group 18, 100 ✓	Group $\frac{31}{2}$ , 100 ✓	
Group 19, 100 ✓	Group 32, 100 ✓	
Group 20, 100 ✓		
Group 21, <del>100</del> 3787, 532446 ✓	Group 21, 100 ✓	

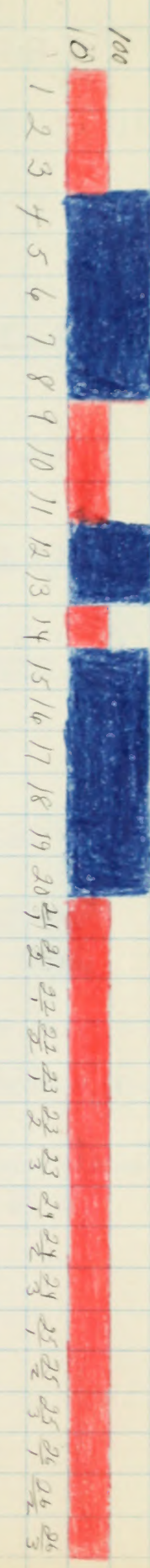




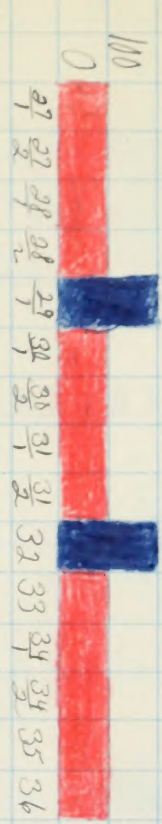
Graph - The Ohio Proposition in Long Division

Grade .

1st Trial October 24, 1928 - January 15, 1929.



1st Trial Cont



2nd Trial January 21, 1929 March 18, 1929.



2nd Trial Cont

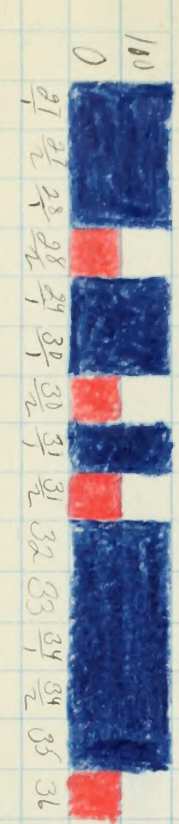
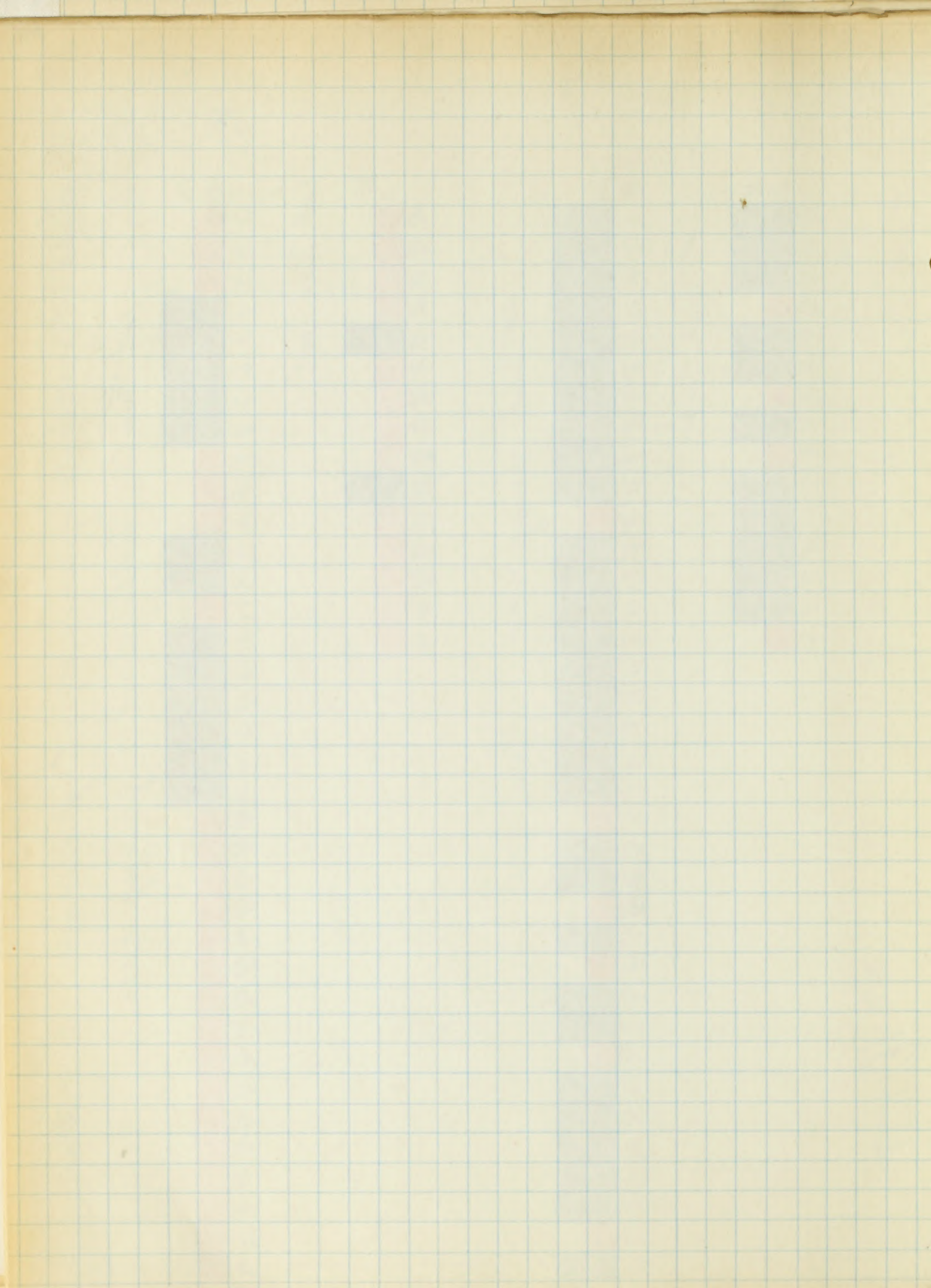


Table 81

100% efficiency failure

Cathleen M.







GRADE VI - 36 PUPILS

DISTRIBUTION OF SCORES

TO SHOW PROGRESSION

TOWARDS 100% EFFICIENCY IN

FUNCTIONAL ARITHMETIC IN

DRILL SERVICE IN LONG DIVISION

PENALTY SCORE BASIS (See Charts No. 32-133)

DRILL SERVICE GIVEN TWICE

First Trial from October 24, 1928 to January 15, 1929

Second Trial from January 21, 1928 to March 18, 1929

- NOTE: 1. Two sets of drills were given each day from March 1-18;  
one in the morning(A.M.)and one in the afternoon (P.M.)
2. Drills containing more than ten examples were divided  
into one, two, or three parts. (See Drill  $\frac{22}{1}$ ,  $\frac{22}{2}$ )

CHAPTER 10 - THE FUTURE

THE FUTURE OF THE WORLD

THE FUTURE OF THE NATION

THE FUTURE OF THE INDIVIDUAL

THE FUTURE OF THE ECONOMY

THE FUTURE OF THE ENVIRONMENT

THE FUTURE OF THE CULTURE

THE FUTURE OF THE SOCIETY

THE FUTURE OF THE POLITICAL SYSTEM

THE FUTURE OF THE INTERNATIONAL RELATIONS

THE FUTURE OF THE SCIENCE AND TECHNOLOGY

THE FUTURE OF THE ARTS AND LETTERS

THE FUTURE OF THE RELIGION

THE FUTURE OF THE PHILOSOPHY

THE FUTURE OF THE HISTORY

THE FUTURE OF THE GEOGRAPHY

THE FUTURE OF THE PSYCHOLOGY

THE FUTURE OF THE MEDICINE

THE FUTURE OF THE LAW

THE FUTURE OF THE EDUCATION



GRADE VI - 36 PUPILS


DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY  
IN THE DRILL SERVICE IN LONG DIVISION


(SEE CHARTS NO. 82-133)

THE CHARTS ARE READ AS FOLLOWS:

1 - 36      Frequencies

0 - 100     Score

 = 100% Efficiency


 = Failure

AMOUNT OF TIME

First Trial from October 24, 1928 - January 15, 1929

Second Trial from January 21, 1929 - March 18, 1929

Ten or twenty minutes allowed daily for the Long Division Drill

NOTE:  - Failure - A child who failed in one or more examples was a failure until he received 100% in that group





LONG DIVISION DRILL SERVICE  
RULE I

GROUP I-1 PAGE 6  
GRADE VI

Oct. 24, 1928

Jan. 21, 1929

36  
35  
34  
33  
32  
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1

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP I-1 DRILL SERVICE GIVEN TWICE

Oct. 24, 1928



and

Jan. 21, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

 100% efficiency  
 failure

NOTE: A Child who fails in one or more  
examples is a failure.

Oct. 24 (Median 100  
1928 (Mean 97.2%)

Jan. 21 (Median 100  
1929 (Mean 100%)

CHART NO. 82

0 100

0 100







## RULE I

## GRADE VI

Oct. 25, 1928

Jan. 22, 1929

36  
35  
34  
33  
32  
31  
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4  
3  
2  
1

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP I-2 DRILL SERVICE GIVEN TWICE

Oct. 25, 1928

and

Jan. 22, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score



100% efficiency

failure

Oct. 25 (Median 100  
1928 (Mean 94.4%Jan. 22 (Median 100  
1929 (Mean 100%

CHART NO. 83







## RULE I

## GRADE VI

Oct. 26, 1928

Jan. 23, 1929

36  
35  
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4  
3  
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1DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP I-3 DRILL SERVICE GIVEN TWICE

Oct. 26, 1928

and

Jan. 23, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failure

Oct. 26 (Median 100

1928 (Mean 91.6%

Jan. 23 (Median 100

1929 (Mean 100%

CHART NO. 84

0 100

0 100







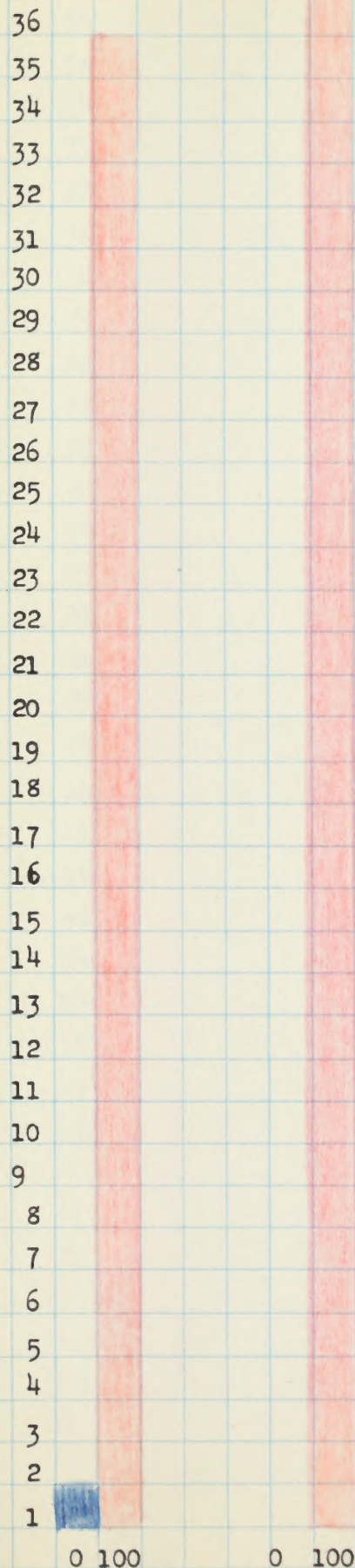
## LONG DIVISION DRILL SERVICE GROUP I-4 PAGE 6

RULE I

GRADE VI

Oct. 29, 1928

Jan. 24, 1929



DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP I-4 DRILL SERVICE GIVEN TWICE

Oct. 29, 1928

and

Jan. 24, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

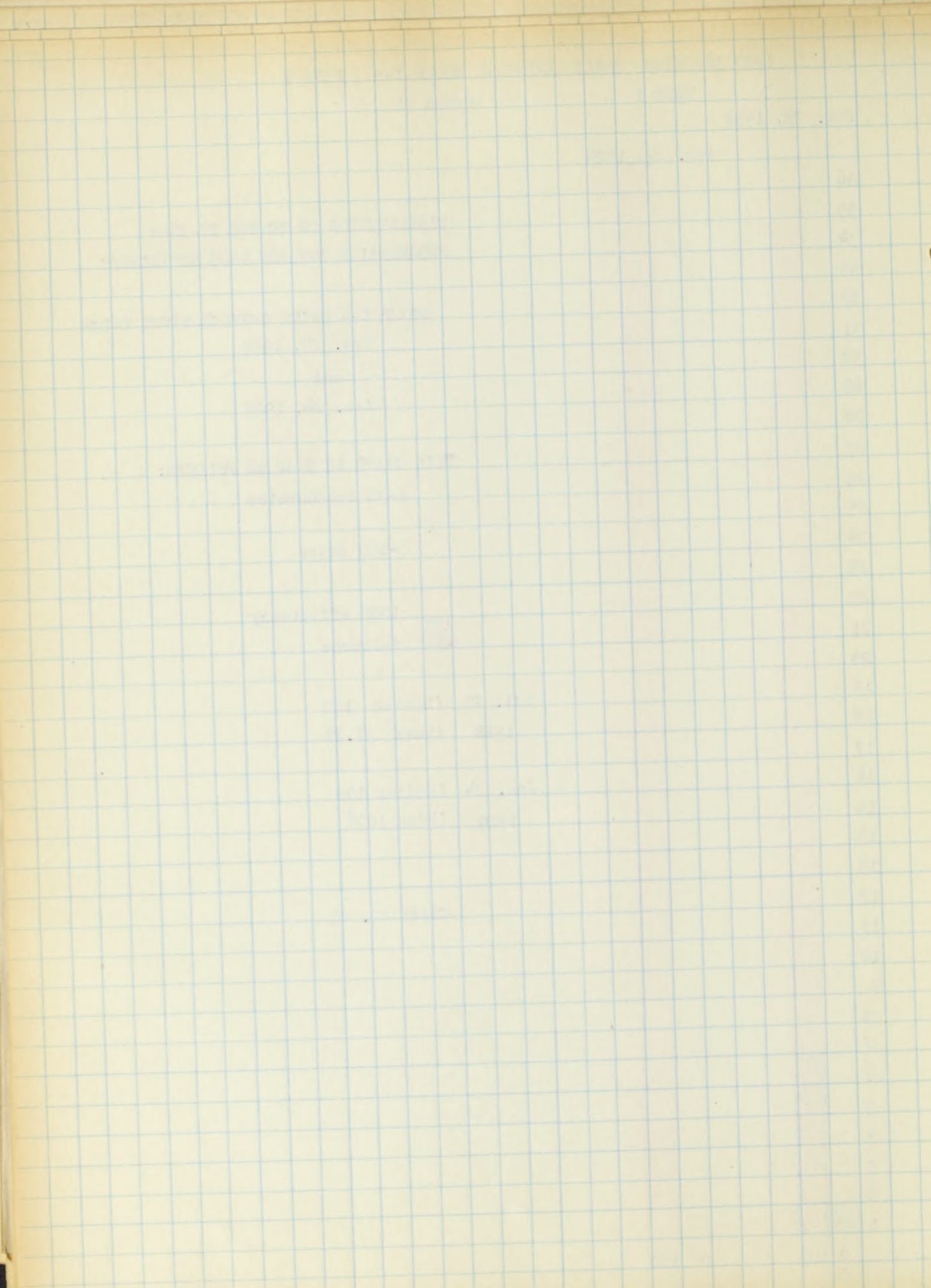
100% efficiency  
failures

Oct. 29 (Median 100  
1928 (Mean 97.2%)

Jan. 24 (Median 100  
1929 (Mean 100%)

CHART NO. 85







## LONG DIVISION DRILL SERVICE GROUP I-5 Page 6

RULE I

GRADE VI

Oct. 30, 1928

Jan. 25, 1929

36  
35  
34  
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DISTRIBUTION OF SCORE TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP I-5 DRILL SERVICE GIVEN TWICE

Oct. 30, 1928

and

Jan. 25, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failures

Oct. 30 (Median 100

1928 (Mean 83.3%)

Jan. 25 (Median 100

1929 (Mean 100%)

CHART NO. 86

0 100

0 100







## LONG DIVISION DRILL SERVICE GROUP I-6

PAGE 7

## RULE I

GRADE VI

Oct. 31, 1928

Jan. 28, 1929

36  
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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP I-6 DRILL SERVICE GIVEN TWICE

Oct. 31, 1928

and

Jan. 28, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency  
failure

Oct. 31 (Median 100  
1928 (Mean 94.4%)

Jan. 28 (Median 100  
1929 (Mean 100%)

CHART NO. 87

0 100

0 100







## LONG DIVISION DRILL SERVICE GROUP I-7 Page 7

Nov. 1, 1928

RULE I

GRADE VI

Jan. 29, 1929

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP I-7 DRILL SERVICE GIVEN TWICE

Nov. 1, 1928


and


Jan. 29, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

 100% efficiency

 failures

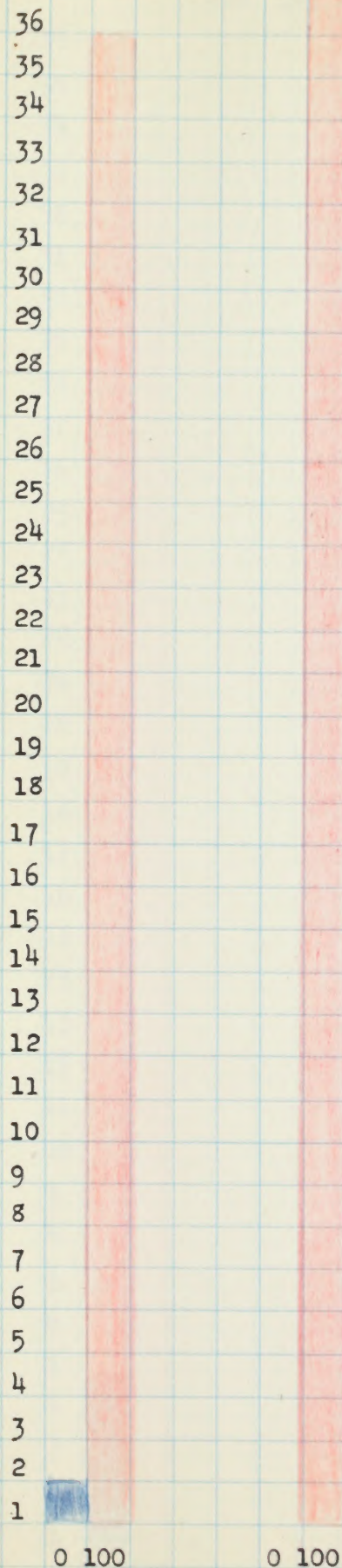
Nov. 1 (Median 100

1928 (Mean 97.2%)

Jan. 29 (Median 100

1929 (Mean 100%)

CHART NO. 88









RULE I

GRADE VI

Nov. 2, 1928

Jan. 30, 1929

36  
35  
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1

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP I-8 DRILL SERVICE GIVEN TWICE

Nov. 2, 1928


and


Jan. 30, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

 100% efficiency

 failure

Nov. 2 (Median 100

1928 (Mean 88.8%)

Jan. 30 (Median 100

1929 (Mean 100%)

CHART NO. 89

0 100

0 100







## LONG DIVISION DRILL SERVICE GROUP I-9

RULE I

GRADE VI

Nov. 5, 1928

Jan. 31, 1929

36  
35  
34  
33  
32  
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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP I-9 DRILL SERVICE GIVEN TWICE

Nov. 5, 1928

and

Jan. 31, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score



100% efficiency

failure

Nov. 5 (Median 100  
1928 (Mean 83.3%)

Jan. 31 (Median 100  
1929 (Mean 100%)

CHART NO. 90

0 100

0 100







## LONG DIVISION DRILL SERVICE GROUP I-10

RULE I

GRADE VI

Page 7

Nov. 6, 1928

Feb. 1, 1929

36  
35  
34  
33  
32  
31  
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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP I-10 DRILL SERVICE GIVEN TWICE

Nov. 6, 1928

and

Feb. 1, 1929

THIS CHART READS AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failure

Nov. 6 (Median 100

1928 (Mean 100%

Feb. 1 (Median 100

1929 (Mean 100%

CHART NO. 91

0 100

0 100







## LONG DIVISION DRILL SERVICE

GROUP II-1 Page 9

## RULE I

Nov. 7, 1928

Feb. 4, 1929

36  
35  
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14  
13  
12  
11  
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9  
8  
7  
6  
5  
4  
3  
2  
1

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP II-1 DRILL SERVICE GIVEN TWICE

Nov. 7, 1928

and

Feb. 4, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency  
failure

Nov. 7 (Median 100

1928 (Mean 86.1%

Feb. 4, (Median 100

1929 (Mean 100%

CHART No. 92







## LONG DIVISION DRILL SERVICE GROUP II-2 Page 9

Nov. 8, 1928

RULE I

Feb. 5, 1929

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP II-2 DRILL SERVICE GIVEN TWICE

Nov. 8, 1928

and

Feb. 5, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failure

Nov. 8 (Median 100

1928 (Mean 83.3%

Feb. 5 (Median 100

1929 (Mean 97.2%)

CHART NO. 93

0 100

0 100







## LONG DIVISION DRILL SERVICE GROUP II-3 Page 9

## RULE I

Nov. 9, 1928

Feb. 6, 1929

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP II-3, DRILL SERVICE GIVEN TWICE

Nov. 9, 1928

and

Feb. 6, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failure

Nov. 9 (Median 100  
1928 (Mean 97.2%)

Feb. 6 (Median 100  
1929 (Mean 100%)

CHART NO. 94

0 100

0 100







LONG DIVISION DRILL SERVICE

GROUP II-4

RULE I

GRADE VI

Page 9

Nov. 12, 1928

Feb. 7, 1929

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP II-4 DRILL SERVICE GIVEN TWICE

Nov. 12, 1928

and

Feb. 7, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failure

Nov. 12 (Median 100

1928 (Mean 91.6%

Feb. 7 (Median 100

1929 (Mean 100%

CHART NO. 95

0 100

0 100







## LONG DIVISION DRILL SERVICE GROUP II-5

Nov. 13, 1928

RULE I

GRADE VI

Page 9

Feb. 8, 1929

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DISTRIBUTION OF SCORE TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP II-5 DRILL SERVICE GIVEN TWICE

Nov. 13, 1928

and

Feb. 8, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency  
failure

Nov. 13 (Median 100  
1928 (Mean 88.8%)

Feb. 8 (Median 100  
1929 (Mean 100%)

CHART NO. 96







## LONG DIVISION DRILL SERVICE

GROUP II-6

RULE I

GRADE VI

Page 9

Nov. 14, 1928

Feb. 11, 1929

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DISTRIBUTION OF SCORE TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP II-6 DRILL SERVICE GIVEN TWICE

Nov. 14, 1928

and

Feb. 11, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failure

Nov. 13 (Median 100

1928 (Mean 88.3%

Feb. 8 (Median 100

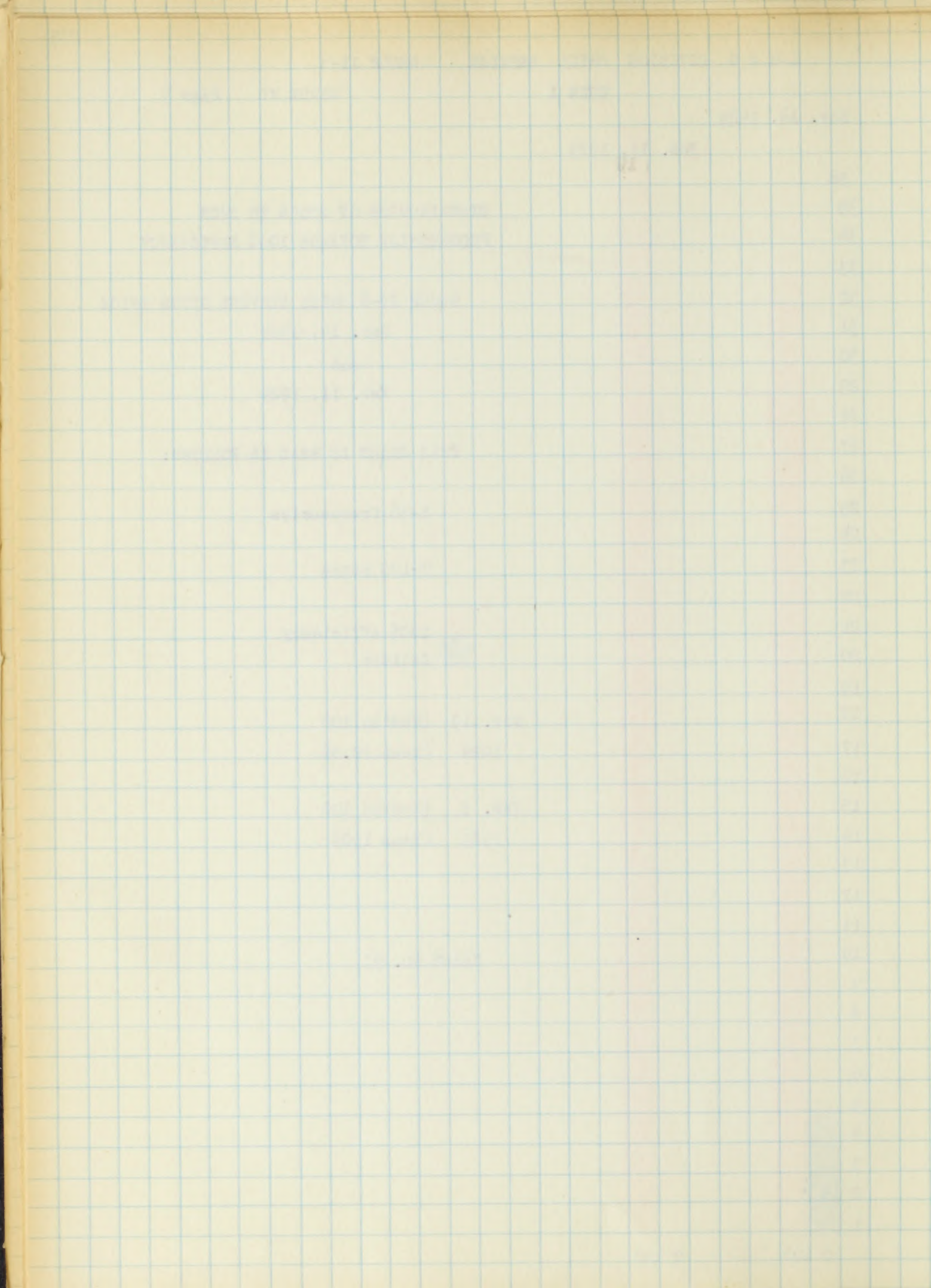
1929 (Mean 100%

CHART NO. 97

0 100

0 100







## LONG DIVISION DRILL SERVICE GROUP II-7

RULE I

GRADE VI

PAGE 10

Nov. 15 1928

Feb. 12, 1929

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP II-7 DRILL SERVICE GIVEN TWICE

Nov. 15, 1928

and

Feb. 12, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failure

Nov. 15 (Median 100

1928 (Mean 97.2%

Feb. 11 (Median 100

1929 (Mean 100%

CHART NO. 98

0 100

0 100







## LONG DIVISION DRILL SERVICE GROUP II-8

RULE I

GRADE VI

Page 10

Nov. 15, 1928

Feb. 13, 1929

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DISTRIBUTION OF SCORES TO SHOW

PROGRESSION TOWARDS 100% EFFICIENCY

GROUP II-8 Drill Service Given Twice

Nov. 16, 1928

and

Feb. 13, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failure

Nov. 15 (Median 100

1928 (Mean 86.1%

Feb. 12 (Median 100

1929 (Mean 100%

CHART NO. 99

0 100

0 100







## LONG DIVISION DRILL SERVICE GROUP II-9

RULE I

GRADE VI

Page 10

Nov. 19, 1928

Feb. 14, 1929

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP II- 9 DRILL SERVICE GIVEN TWICE

Nov. 19, 1928

and

Feb. 14, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failure

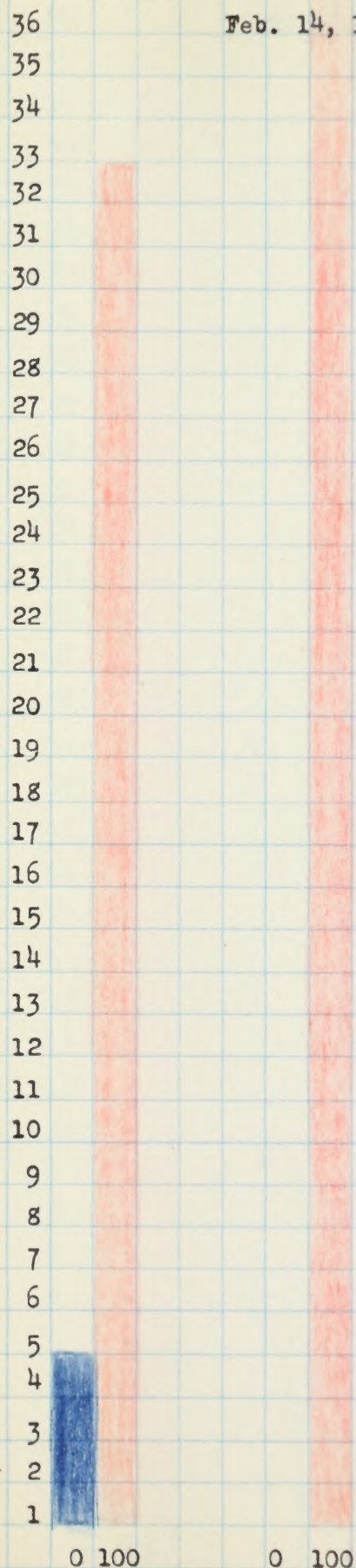
Nov. 19 (Median 100

1928 (Mean 83.8%

Feb. 14 (Median 100

1929 (Mean 100%

CHART NO. 100









## LONG DIVISION DRILL SERVICE GROUP II- 10

RULE I

GRADE VI

PAGE 10

Nov. 20, 1928

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Feb. 15, 1929

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP II-10 DRILL SERVICE GIVEN TWICE

Nov. 20, 1928

and

Feb. 15, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failure

Nov. 20 (Median 100

1928 (Mean 94.4%

Feb. 15 )Median 100

1929 (Mean 97.2%

CHART NO. 101

0 100

0 100







LONG DIVISION DRILL SERVICE GROUP III-<sup>21</sup>/<sub>1</sub>

RULE I

Page 12

Nov. 21, 1928

Feb. 18, 1929

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP III-<sup>21</sup>/<sub>1</sub> DRILL SERVICE GIVEN TWICE

Nov. 21, 1928

and

Feb. 18, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency  
failure

Nov. 21 (Median 100  
1928 (Mean 83.3%)

Feb. 18 (Median 100  
1929 (Mean 94.4%)

CHART NO. 102

0 100

0 100







LONG DIVISION DRILL SERVICE GROUP IV-  $\frac{21}{2}$   
 RULE I GRADE VI

PAGE 13

Nov. 22, 1928

Feb. 19, 1929

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DISTRIBUTION OF SCORES TO SHOW  
 PROGRESSION TOWARDS 100% EFFICIENCY

GROUP IV-  $\frac{21}{2}$  DRILL SERVICE GIVEN TWICE

Nov. 22, 1928

and

Feb. 19, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency  
 failure

Nov. 22 (Median 100  
 1928 (Mean 75%)

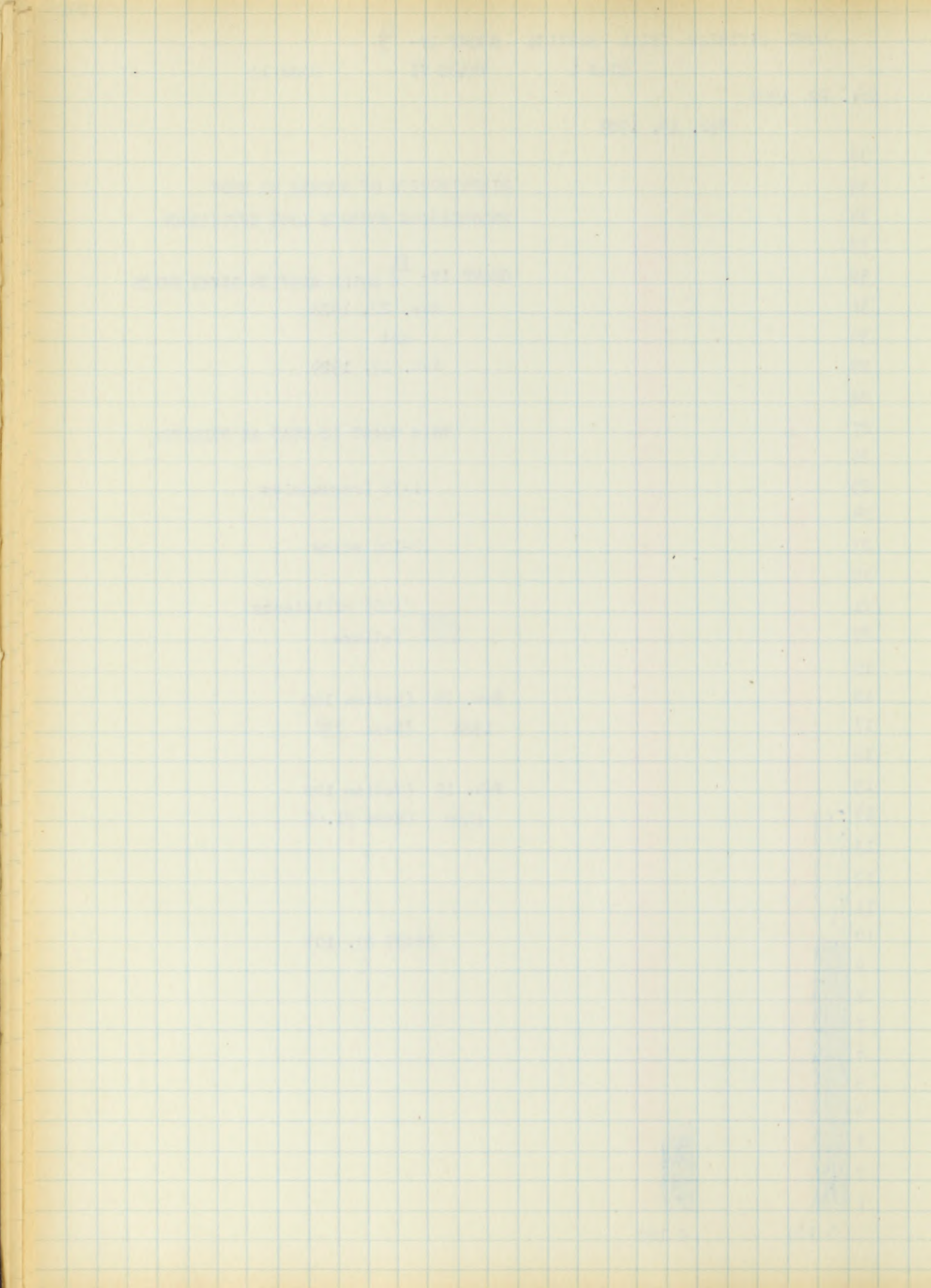
Feb. 19 (Median 100  
 1929 (Mean 91.6%)

CHART NO. 103

0 100

0 100







LONG DIVISION DRILL SERVICE GROUP V-  $\frac{22}{1}$ 

RULE I

GRADE VI

PAGE 14

Nov. 23, 1928

Feb. 20, 1929

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP V-  $\frac{22}{1}$  DRILL SERVICE GIVEN TWICE

Nov. 23, 1928

and

Feb. 20, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failure

Nov. 23 ( Median 100

1928 ( Mean 63.8%

Feb. 20 ( Median 100

1929 ( Mean 94.4%

CHART NO. 104

0 100

0 100







LONG DIVISION DRILL SERVICE GROUP V-  $\frac{22}{2}$ 

Nov. 26, 1928

RULE I

GRADE VI

PAGE 14

Feb. 21, 1929

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP V-  $\frac{22}{2}$  DRILL SERVICE GIVEN TWICE

Nov. 26, 1928

and

Feb. 21, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score



100% efficiency

failure

Nov. 26 ( Median 100

1928 ( Mean 83.3%

Feb. 21 (Median 100

1929 (Mean 100%

CHART NO. 105







Nov. 27, 1928

RULE I

GRADE VI

PAGE 15

Feb. 25, 1929

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP VI-  $\frac{23}{1}$  DRILL SERVICE GIVEN TWICE

Nov. 27, 1928



and

Feb. 25, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

 100% efficiency  
 failure

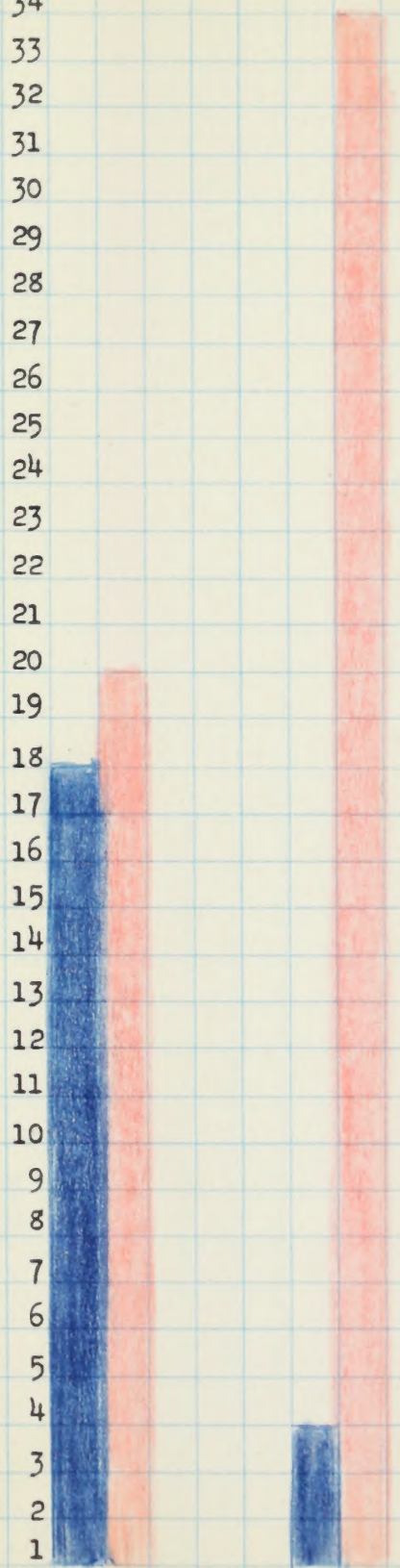
Nov. 27 (Median 100  
1928 (Mean 47.2%

Feb. 25 (Median 100  
1929 (Mean 91.6%

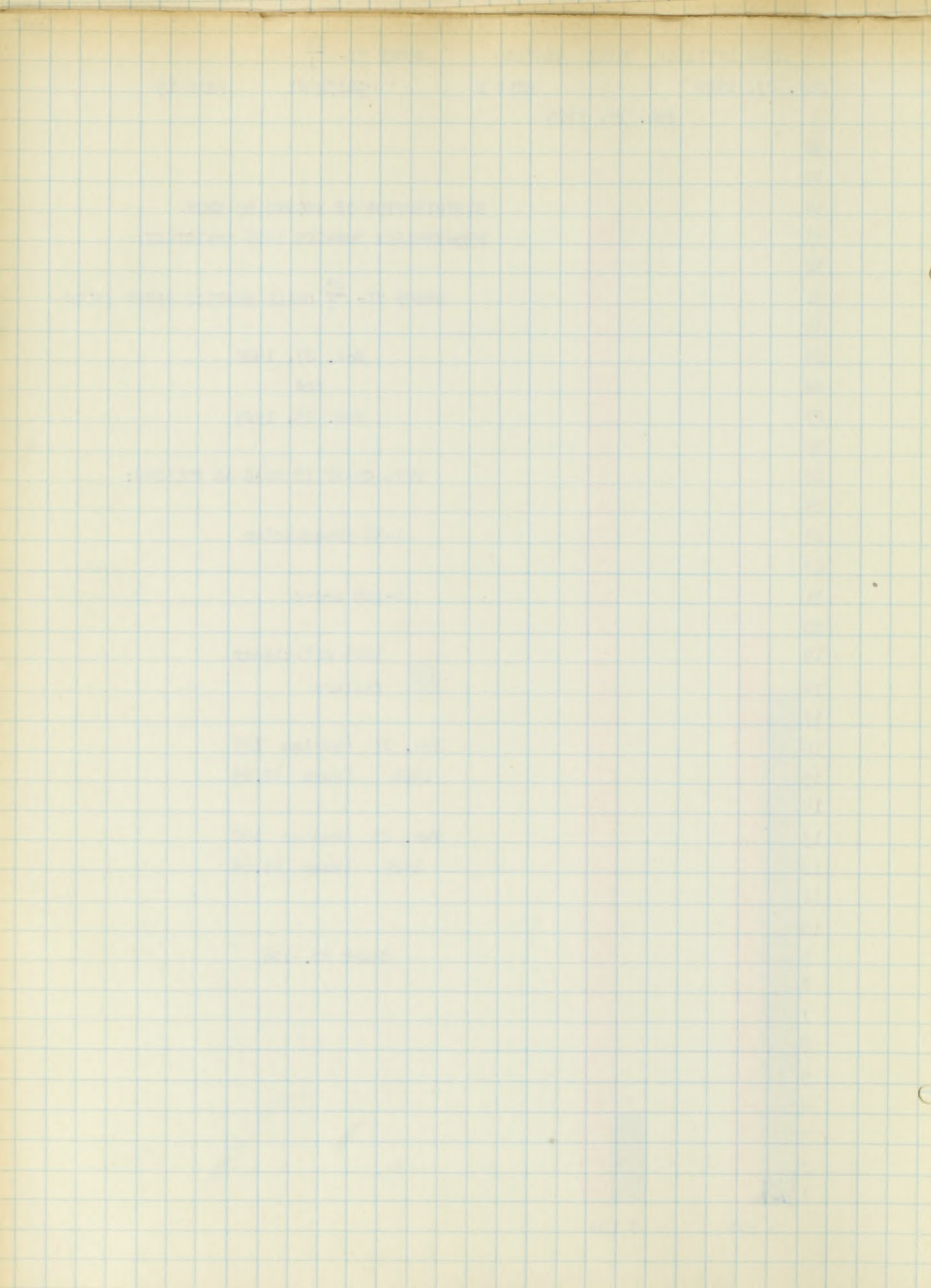
CHART NO. 106

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LONG DIVISION DRILL SERVICE GROUP VI -  $\frac{23}{2}$ 

Nov. 28, 1928

RULE I

GRADE VI

PAGE 15

Feb. 26, 1929

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1DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCYGROUP VI -  $\frac{23}{2}$  DRILL SERVICE GIVEN TWICE  
Nov. 28, 1928  
and  
Feb. 26, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

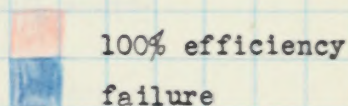
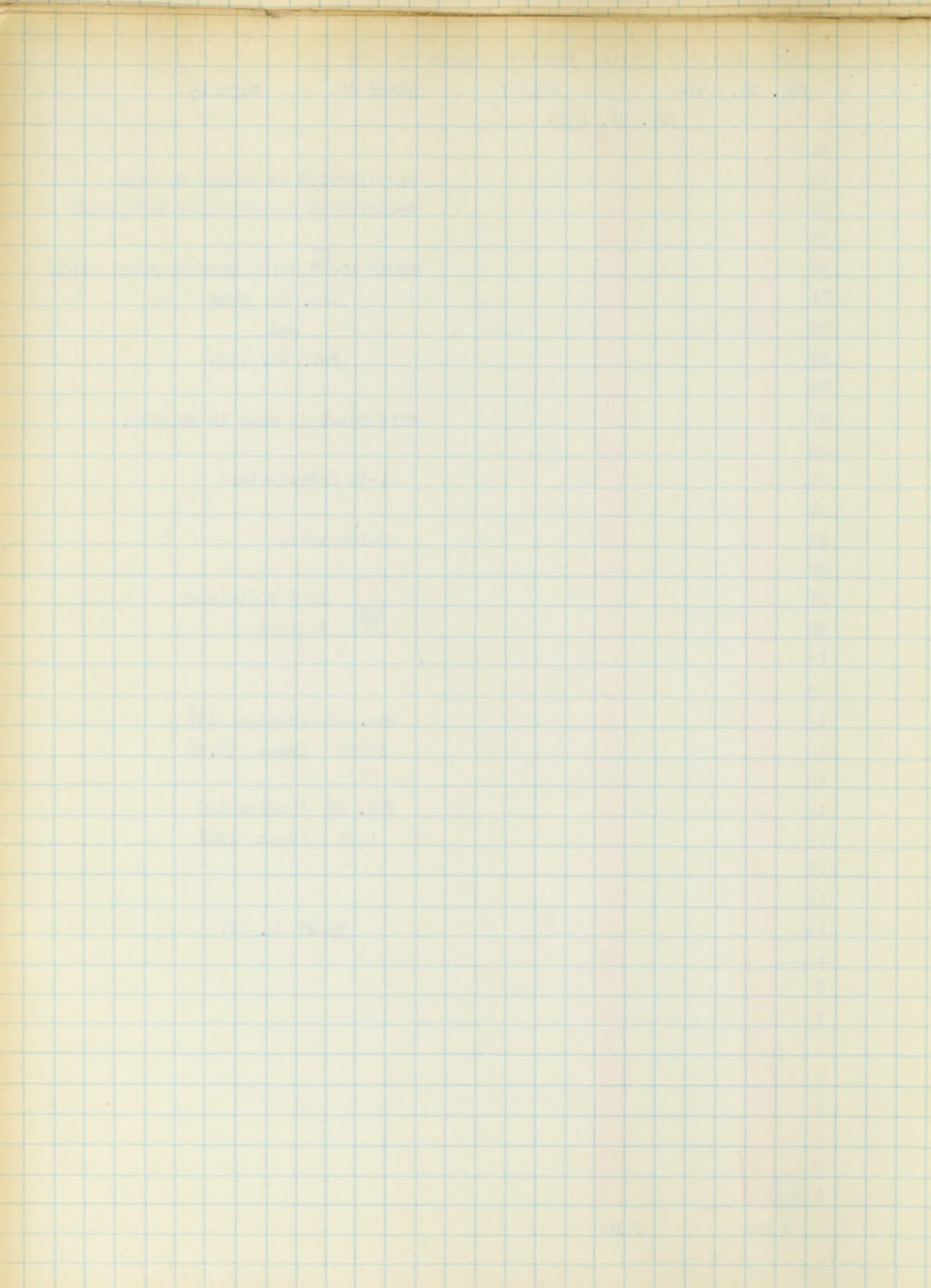

 100% efficiency  
failure
Nov. 28 (Median 100  
1928 (Mean 97.2%)Feb. 26 (Median 100  
1929 (Mean 100%)

CHART NO. 107

0 100

0 100







LONG DIVISION DRILL SERVICE GROUP VI-  $\frac{23}{3}$

Dec. 3, 1928                      RULE I                      GRADE VI                      Page 15

Feb. 27, 1929

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP VI-  $\frac{23}{3}$  DRILL SERVICE GIVEN TWICE  
Dec. 3, 1928  
and  
Feb. 27, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

 100% efficiency  
 failure

Dec. 3 (Median 100  
1928 (Mean 100%)

Feb. 27( Median 100  
1929 (Mean 100%)

CHART NO. 108

0 100                      0 100







Dec. 4, 1928

Feb. 28, 1929

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP VII-  $\frac{24}{1}$  DRILL SERVICE GIVEN TWICE  
Dec. 4, 1928  
and  
Feb. 28, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

 100% efficiency  
 failure

Dec. 4 (Median 100  
1928 (mean 100%)  
  
Feb. 28 (Median 100  
1929 (Mean 100%)

CHART NO. 109

0 100

0 100







LONG DIVISION DRILL SERVICE GROUP VII- $\frac{24}{2}$ 

RULE I

GRADE VI

Page 16

Dec. 5, 1928

Mar. 1, 1929

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP VII- $\frac{24}{2}$  DRILL SERVICE GIVEN TWICE  
Dec. 5, 1928  
and  
Mar. 1, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

1-36 Frequencies

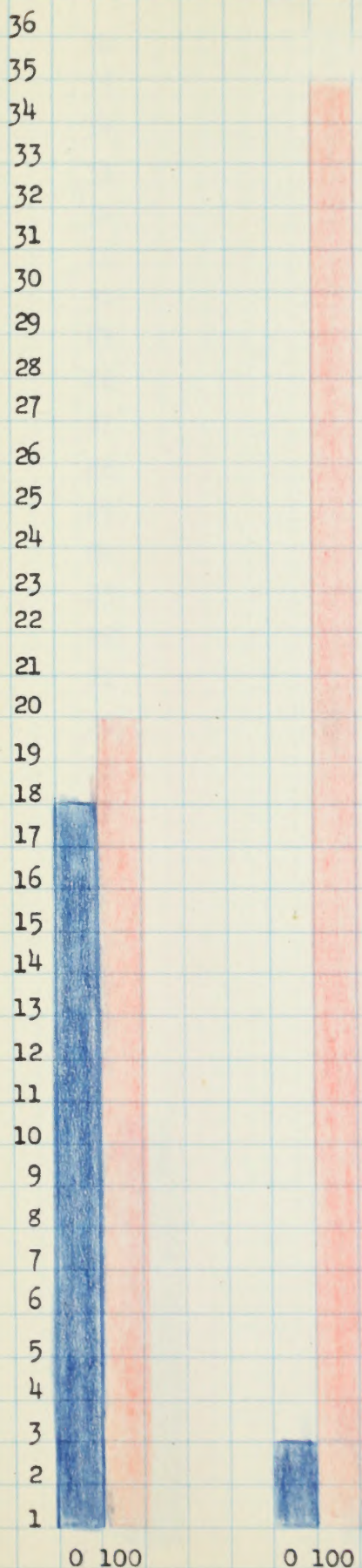
0-100

100% efficiency  
failure

Dec. 5, (Median 100  
1928 (Mean 47.2%)

Mar. 1 (Median 100  
1929 (Mean 94.4%)

CHART NO. 110









## LONG DIVISION DRILL SERVICE

GROUP VII- $\frac{24}{3}$ 

## RULE I

Dec. 6, 1928

Mar. 1, 1929

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DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP VII- $\frac{24}{3}$  DRILL SERVICE GIVEN TWICE  
Dec. 6, 1928  
and  
Mar. 1, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency  
failure

Dec. 6 (Median 100  
1928 (Mean 72.2%)

Mar. 4 (Median 100  
1929 (Mean 97.2%)

CHART NO. 111

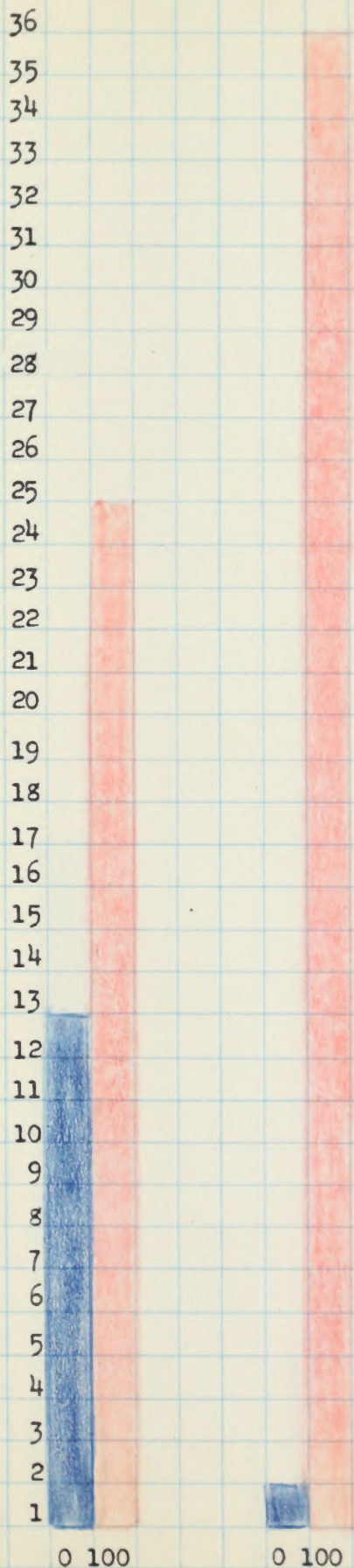






Dec. 7, 1928

Mar. 4, 1929



DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP VIII-<sup>25</sup>/<sub>1</sub> DRILL SERVICE GIVEN TWICE

Dec. 7, 1928

and

Mar. 4, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency  
failure

Dec. 7 (Median 100  
1928 (Mean 66.6%)

Mar. 5 (Median 100  
1929 (Mean 97.2%)

CHART NO. 112







Dec. 10, 1928

Mar. 4, 1929

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

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP VIII-  $\frac{25}{2}$  DRILL SERVICE GIVEN TWICE  
Dec. 10, 1928  
and  
Mar. 4, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

 100% efficiency  
 failure

Dec. 10 (Median 100  
1928 (Mean 55.5%

Mar. 6, (Median 100  
1929 (Mean 97.2%

CHART NO. 113

0 100

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Dec. 11, 1928

RULE I

GRADE VI

Mar. 5, 1929

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DISTRIBUTION OF SCORE TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP VIII -  $\frac{25}{3}$  DRILL SERVICE GIVEN TWICE  
Dec. 11, 1928  
and  
Mar. 5, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency  
failure

Dec. 10 (Median 100  
1928 (Mean 61.1%)

Mar. 7 (Median 100  
1929 (Mean 100%)

CHART NO. 114







## LONG DIVISION DRILL SERVICE

GROUP IX  $\frac{26}{1}$  Page 19  
GRADE VI

RULE I

Dec. 12, 1928

Mar. 5, 1929

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1DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCYGROUP IX -  $\frac{26}{1}$  DRILL SERVICE GIVEN TWICE

Dec. 12, 1928

and

Mar. 5, 1929 P. M.

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score



 100% efficiency  
failure
Dec. 12 (Median 100  
1928 (Mean 61.1%)Mar. 8 (Median 100  
1929 (Mean 100%)

CHART NO. 115

0 100

0 100







LONG DIVISION DRILL SERVICE GROUP IX-<sup>26</sup>/<sub>2</sub>

RULE I

GRADE VI

Page 19

Dec. 13, 1928

Mar. 6, 1929

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3  
2  
1

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP IX - <sup>26</sup>/<sub>2</sub> DRILL SERVICE GIVEN TWICE

Dec. 13, 1928

and

Mar. 6, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency  
failure

Dec. 13 (Median 100  
1928 (Mean 83.8%)

Mar. 11 (Median 100  
1929 (Mean 100%)

CHART NO. 116







RULE I

GRADE VI

Dec. 14, 1928

Mar. 6, 1929

36  
35  
34  
33  
32  
31  
30  
29  
28  
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10  
9  
8  
7  
6  
5  
4  
3  
2  
1DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCYGROUP IX -  $\frac{26}{3}$  DRILL SERVICE GIVEN TWICE  
Dec. 14, 1928  
and  
Mar. 6, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:


1-36 frequencies  
0-100 score 100% efficiency  
failureDec. 14 ( Median 100  
1928 ( Mean 77.7%Mar. 12 ( Median 100  
1929 ( Mean 100%

CHART NO. 117

0 100

0 100







Dec. 17, 1928

Mar. 7, 1929

36  
35  
34  
33  
32  
31  
30  
29  
28  
27  
26  
25  
24  
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8  
7  
6  
5  
4  
3  
2  
1

## DISTRIBUTION OF SCORES TO SHOW

PROGRESSION TOWARDS 100% EFFICIENCY

GROUP IX -  $\frac{27}{1}$  Exceptions to Rule I

DRILL SERVICE GIVEN TWICE

Dec. 17, 1928

and

Mar. 7, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failure

Dec. 17 (Median 100

1928 (Mean 83.3%)

Mar. 13 (Median 100

1929 (Mean 100%)

CHART NO. 118

0 100

0 100







LONG DIVISION DRILL SERVICE GROUP IX -  $\frac{27}{2}$  EXCEPTIONS

Dec. 18, 1928

RULE I Exceptions GRADE VI

Page 21

Mar. 7, 1929

36  
35  
34  
33  
32  
31  
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5  
4  
3  
2  
1

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP IX - 27 Exceptions to Rule I  
DRILL SERVICE GIVEN TWICE

Dec. 18, 1928

and

Mar. 7, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failure

Dec. 18 (Median 100

1928 (Mean 83.3%)

Mar. 7 (Median 100

1929 (Mean 100%)

CHART NO. 119

0 100

0 100



1. The first part of the paper is devoted to a general discussion of the problem.

2. In the second part, we consider the case of a single particle.

3. The third part is devoted to the case of a system of particles.

4. In the fourth part, we consider the case of a continuous medium.

5. The fifth part is devoted to the case of a system of continuous media.

6. In the sixth part, we consider the case of a single continuous medium.

7. The seventh part is devoted to the case of a system of continuous media.

8. In the eighth part, we consider the case of a single continuous medium.

9. The ninth part is devoted to the case of a system of continuous media.

10. In the tenth part, we consider the case of a single continuous medium.

11. The eleventh part is devoted to the case of a system of continuous media.

12. In the twelfth part, we consider the case of a single continuous medium.

13. The thirteenth part is devoted to the case of a system of continuous media.

14. In the fourteenth part, we consider the case of a single continuous medium.

15. The fifteenth part is devoted to the case of a system of continuous media.

16. In the sixteenth part, we consider the case of a single continuous medium.

17. The seventeenth part is devoted to the case of a system of continuous media.

18. In the eighteenth part, we consider the case of a single continuous medium.

19. The nineteenth part is devoted to the case of a system of continuous media.



## RULE II

GRADE VI

Page 23

Dec. 19, 1928

Mar. 8, 1929

36  
35  
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1DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCYGROUP X -  $\frac{28}{1}$  DRILL SERVICE GIVEN TWICE

Dec. 19, 1928


and

Mar. 8, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

 100% efficiency  
failure

Dec. 19 ( Median 100

1928 ( Mean 58.3%

Mar. 8 (Median 100

1929 (Mean 100%

CHART NO. 120

0 100

0 100







RULE II

GRADE VI

PAGE 23

Dec. 20, 1928

Mar. 8, 1929

36  
35  
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33  
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6  
5  
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3  
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1

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP X -  $\frac{28}{2}$  DRILL SERVICE

GIVEN TWICE

Dec. 20, 1928


and

Mar. 8, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 scores

 100% efficiency  
failure

Dec. 20 (Median 100

1928 (Mean 69.4%)

Mar. 8 (Median 100

1929 (Mean 100%)

CHART NO. 121







Dec. 21, 1928

Mar. 11, 1929

36  
35  
34  
33  
32  
31  
30  
29  
28  
27  
26  
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5  
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2  
1

0 100

0 100


DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP X - 29 Drill Service given Twice  
Dec. 21, 1928  
and  
Mar. 11, 1929 A.M.

This chart is Read as follows:

1-36 frequencies

0-100 score



100% efficiency  
failure

Dec. 21	(Median	100
1928	(Mean	88.8%

Mar. 11	(Median	100
1929	(Mean	100%

CHART NO. 122







LONG DIVISION DRILL SERVICE GROUP X-  $\frac{30}{1}$ 

JAN. 2, 1929

RULE II

GRADE VI

PAGE 24

MAR. 11, 1929

36  
35  
34  
33  
32  
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16  
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14  
13  
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6  
5  
4  
3  
2  
1

0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP X-29 DRILL SERVICE GIVEN TWICE

JAN. 2, 1929

and

MAR. 11, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failure

JAN. 2 (Median 100

1929 ( Mean 77.7%

MAR. 11 (Median 100

1929 (Mean 100%

CHART No. 123







LONG DIVISION DRILL SERVICE

GROUP X -  $\frac{30}{2}$ 

JAN. 3, 1929

RULE II

GRADE VI

Page 24

MAR. 12, 1929



36  
35  
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32  
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8  
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6  
5  
4  
3  
2  
1

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP X -  $\frac{30}{2}$  DRILL SERVICE GIVEN TWICE  
JAN. 3, 1929  
and  
MAR. 12, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:  
1-36 frequencies

0-100 score

 100% efficiency  
 failure

JAN. 3 (Median 100  
1929 (Mean 80.5%)

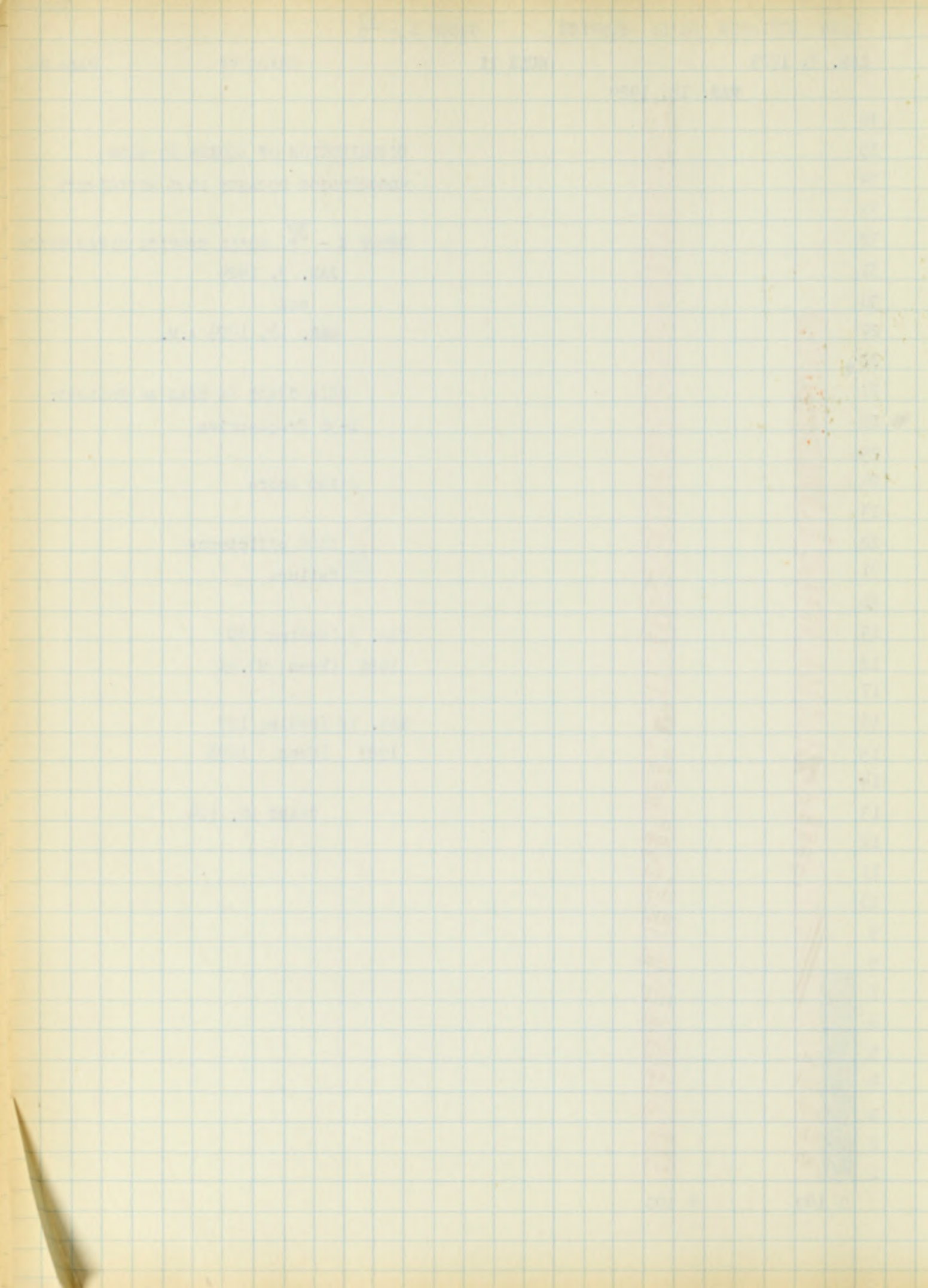
MAR. 12 (Median 100  
1929 (Mean 100%)

CHART NO. 124

0 100

0 100







JAN. 4, 1929

RULE II

GRADE VI

MAR. 12, 1929



DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP X -  $\frac{31}{1}$  Drill Service given twice  
Jan. 4, 1929  
and  
Mar. 12, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

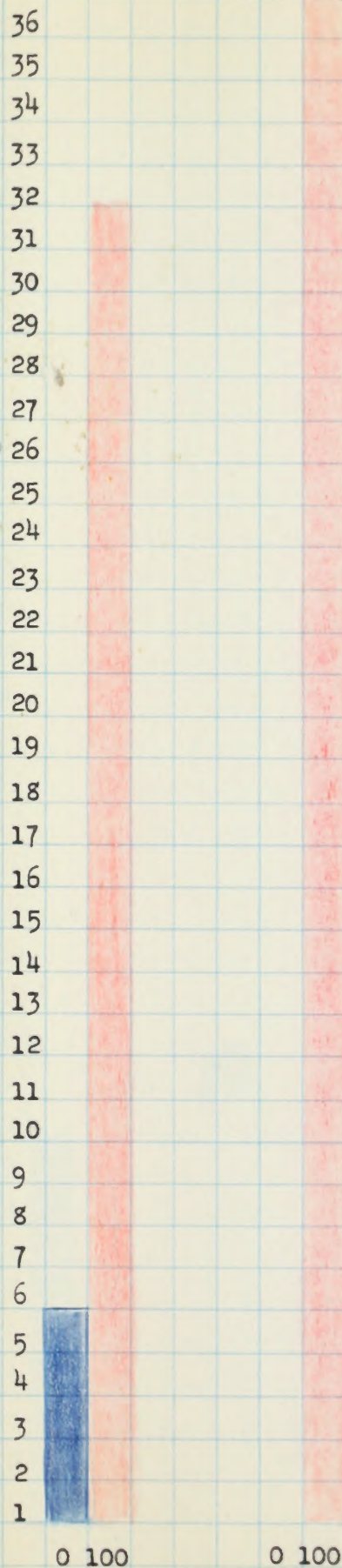
1-36 frequencies

0-100 score

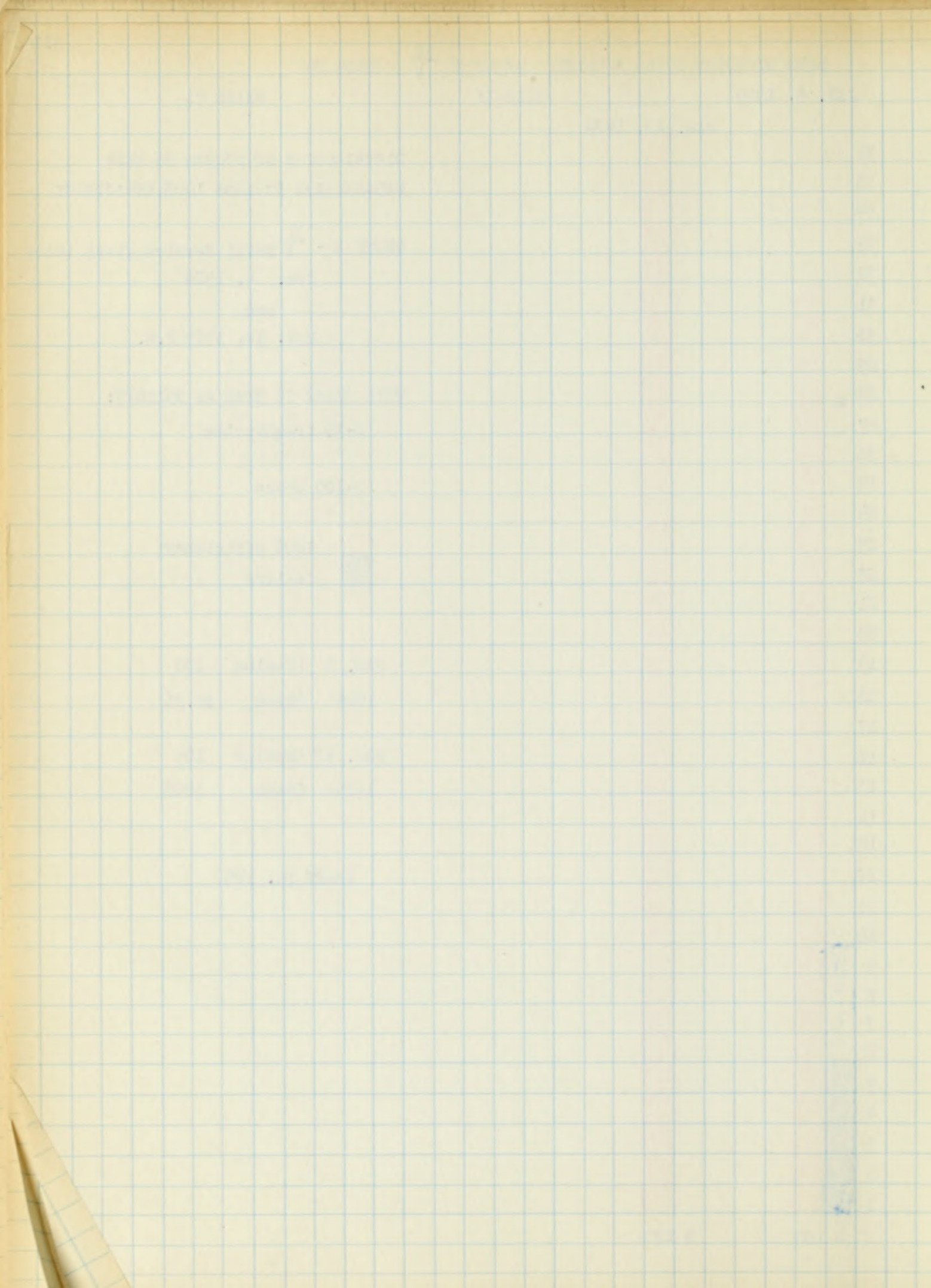
 100% efficiency  
 failure

JAN. 4	(Median	100
1929	(Mean	86.2%
MAR. 12	(Median	100
1929	(Mean	100%

CHART NO. 125









## LONG DIVISION DRILL SERVICE

GROUP X -  $\frac{31}{2}$ 

JAN. 7, 1929

RULE II

GRADE VI

PAGE 25

MAR. 13, 1929

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP X -  $\frac{31}{2}$  DRILL SERVICE GIVEN TWICE  
JAN. 7, 1929



and

Mar. 13, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

 100% efficiency  
 failure

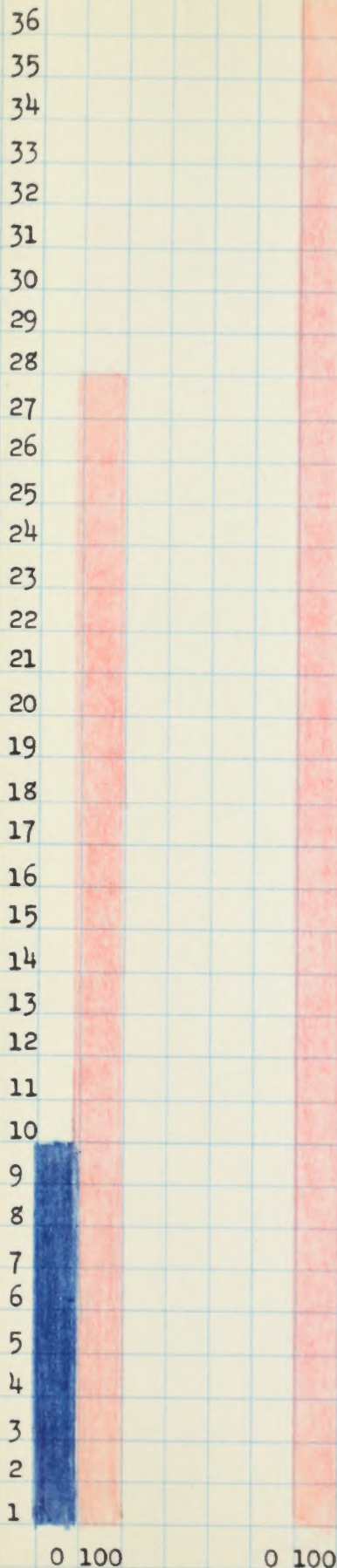
JAN. 7 (Median 100

1929 (Mean 75%

MAR. 13 (Median 100

1929 (Mean 100%

CHART NO. 126









## LONG DIVISION DRILL SERVICE -- GROUP X - 32 (Exceptions)

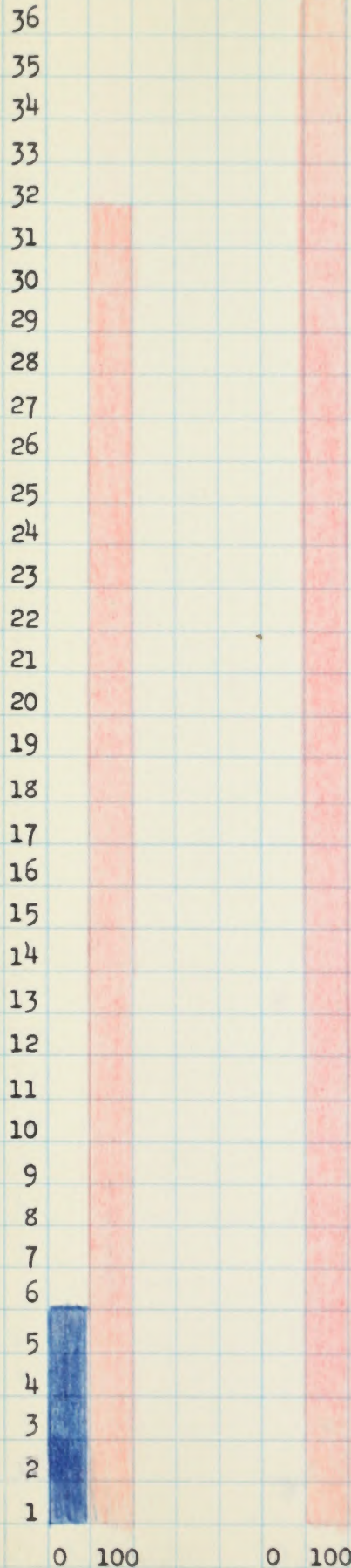
JAN. 8, 1929

RULE II

GRADE VI

PAGE 27

MAR. 13, 1929



DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP X - 32 - EXCEPTIONS TO RULE II  
DRILL SERVICE GIVEN TWICE

JAN. 8, 1929

and

MAR. 13, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

1-36 Frequencies

0-100 score

100% efficiency  
failure

Jan. 8 (Median 100

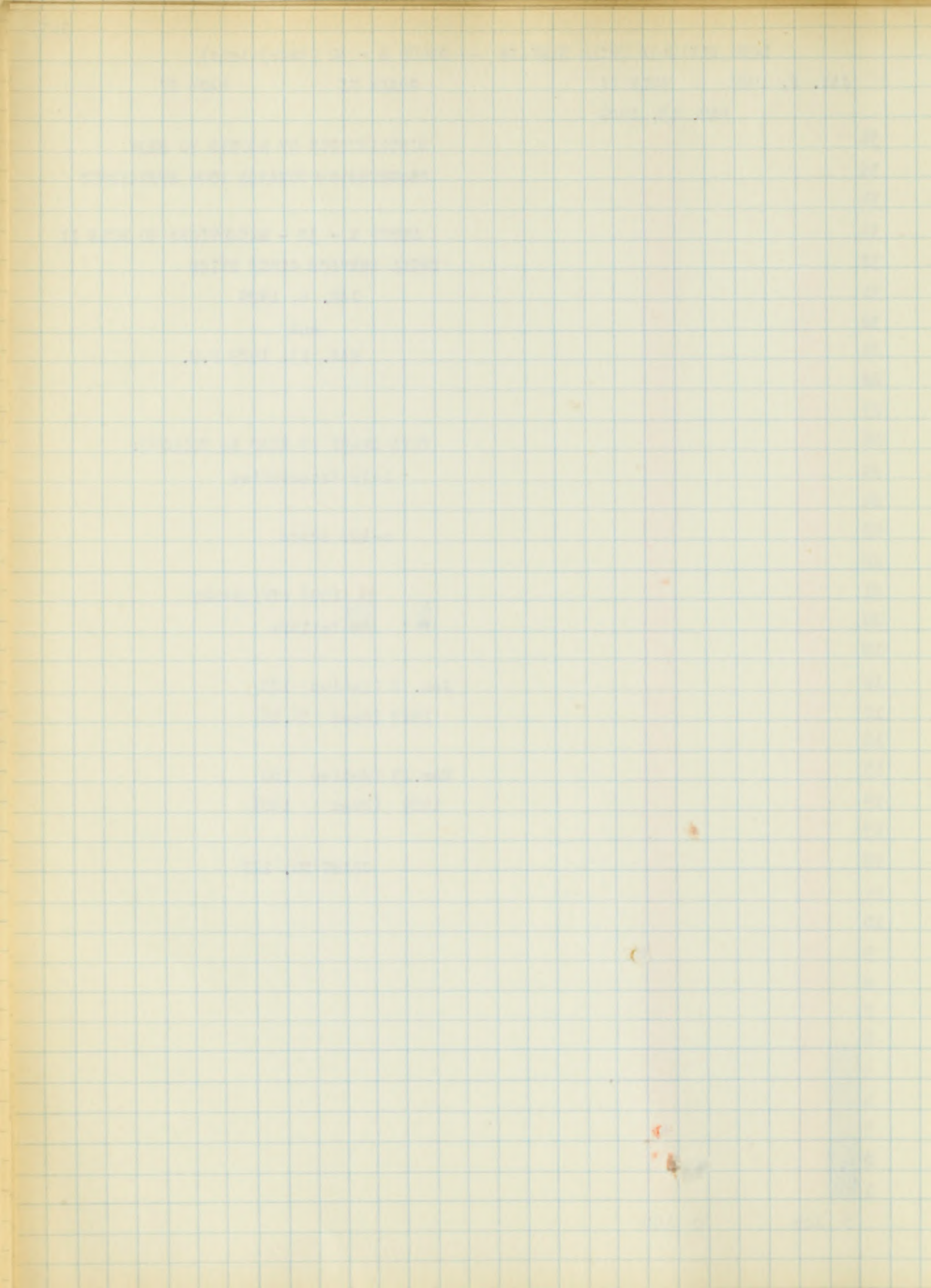
1929 (Mean 86.2%)

Mar. 13 (Median 100

1929 (Mean 100%)

CHART NO. 127







## LONG DIVISION DRILL SERVICE GROUP X - 33

JAN. 9, 1929 EXCEPTIONS TO RULE II

GRADE VI

PAGE 28

MAR. 14, 1929

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP X - 33 EXCEPTIONS TO RULE II  
DRILL SERVICE GIVEN TWICE

JAN. 9, 1929



and

MAR. 14, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

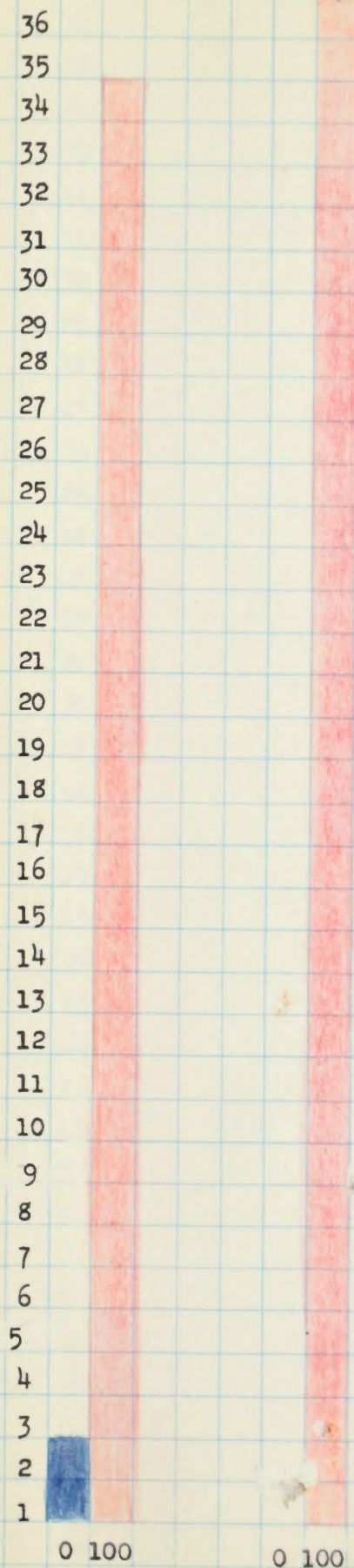
0-100 score

 100% efficiency  
 failure

Jan. 9 (Median 100  
1929 ( Mean 94.4%

Mar. 14 ( Median 100  
1929 ( Mean 100%

CHART NO. 128









LONG DIVISION DRILL SERVICE

GROUP X -  $\frac{34}{1}$

JAN. 10, 1928 EXCEPTIONS TO RULE II

GRADE VI

PAGE 29

MAR. 14, 1929

36  
35  
34  
33  
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1



0 100

0 100

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCY

GROUP X -  $\frac{34}{1}$  Exceptions to Rule II

DRILL SERVICE GIVEN TWICE



Jan. 10, 1929

and

Mar. 14, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies  
0-100 score

 100% efficiency  
 failure

Jan. 10 (Median 100  
1929 (Mean 86.2%

Mar. 14 (Median 100  
1929 (Mean 100%

CHART NO. 129







## LONG DIVISION DRILL SERVICE

JAN. 11, 1929 EXCEPTIONS TO RULE II

MAR. 15, 1929

GROUP X -  $\frac{34}{2}$ 

GRADE VI. PAGE 29

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCYGROUP X - 35 Exceptions to Rule II  
DRILL SERVICE GIVEN TWICE

JANUARY 11, 1929


and

MARCH 15, 1929 A.M.

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score


 100% efficiency  
failure

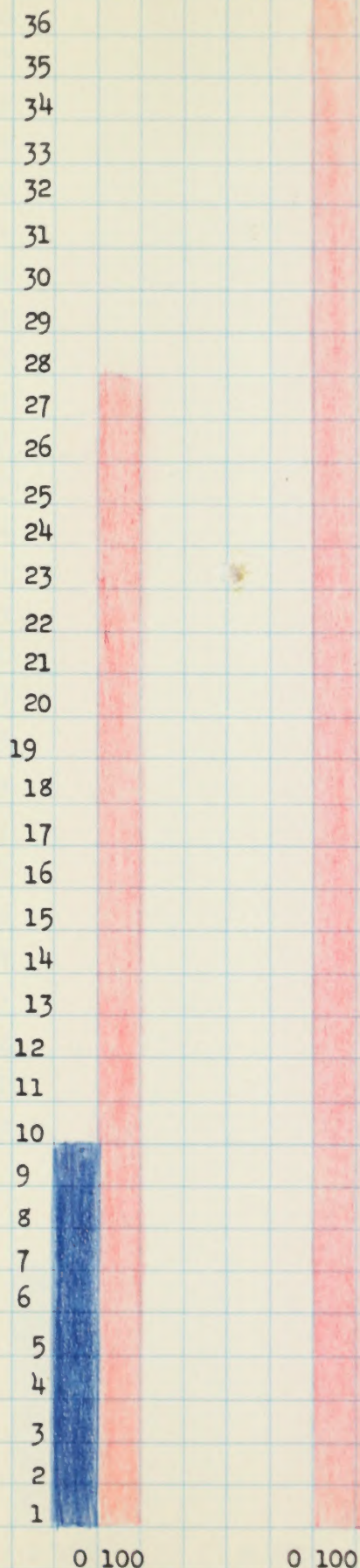
Jan. 11 (Median 100

1929 (Mean 75%

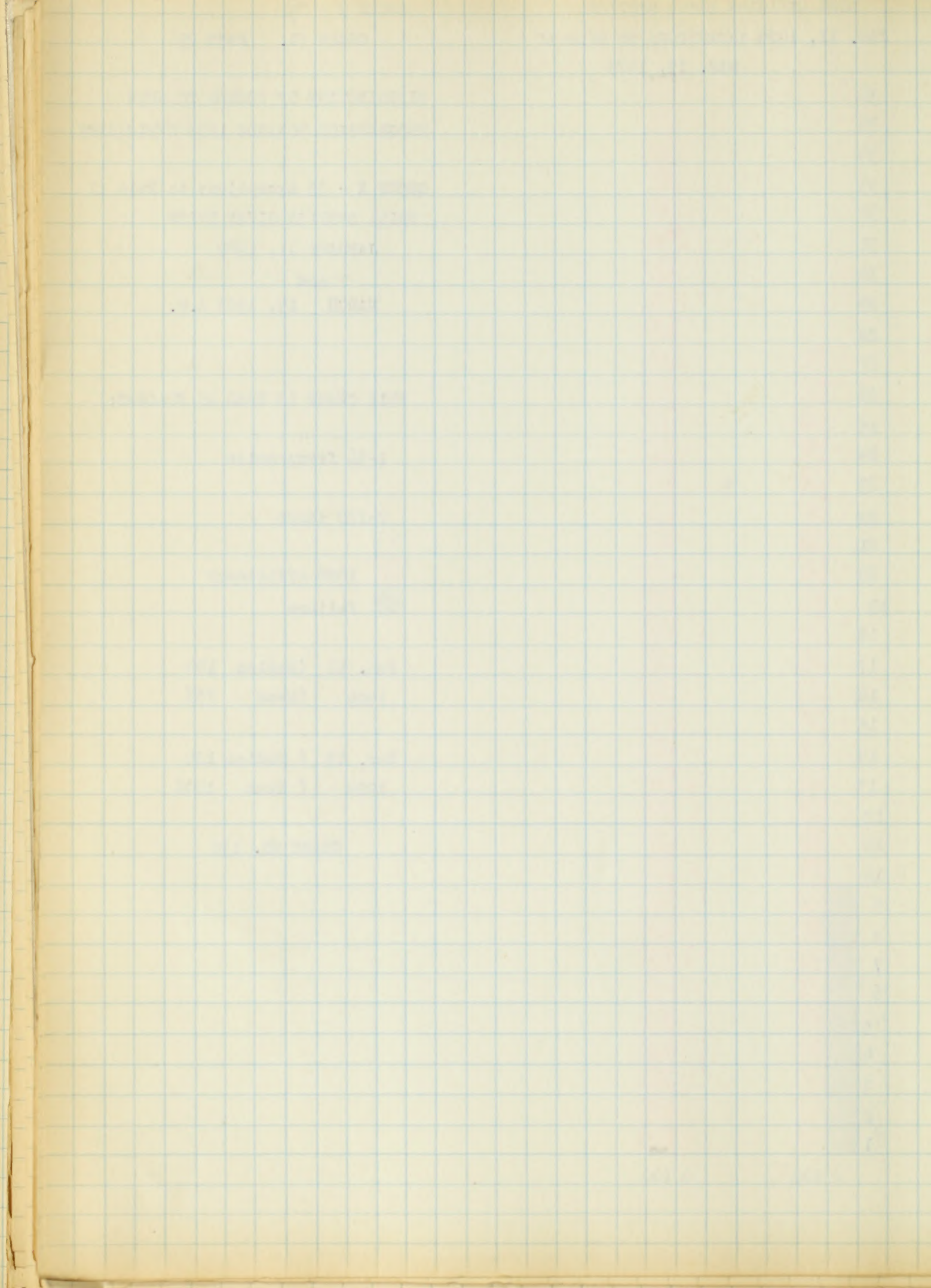
Mar. 15 (Median 100

1929 (Mean 100%

CHART NO. 130









## LONG DIVISION DRILL SERVICE

GROUP X - 35

JAN. 14, 1929 EXCEPTIONS TO RULE II

GRADE VI

PAGE 30

MAR. 15, 1929

DISTRIBUTION OF SCORES TO SHOW  
PROGRESS TOWARDS 100% EFFICIENCY

GROUP X -- 35 EXCEPTIONS TO RULE II  
DRILL SERVICE GIVEN TWICE

Jan. 14, 1929

and

Mar. 15, 1929 P.M.

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score

100% efficiency

failure

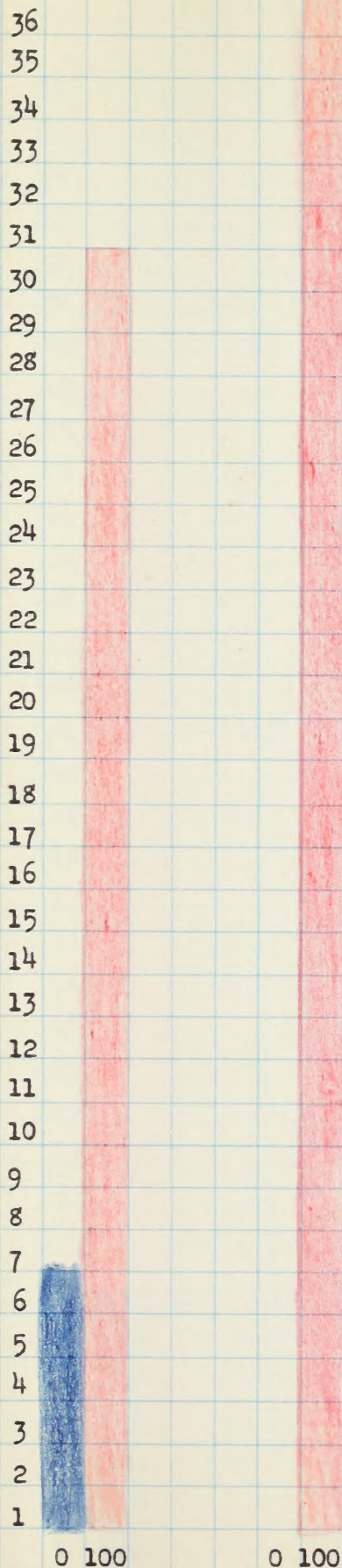
Jan. 14 (Median 100

1929 (Mean 83.3%

Mar. 15 (Median 100

1929 (Mean 100%

CHART NO. 131









JAN. 15, 1929 EXCEPTIONS TO RULE II. GRADE VI. Page 30

MARCH 18, 1929

DISTRIBUTION OF SCORES TO SHOW  
PROGRESSION TOWARDS 100% EFFICIENCYGROUP X - 36 EXCEPTIONS TO RULE II  
DRILL SERVICE GIVEN TWICE.

JANUARY 15, 1929

and

MARCH 18, 1929

THIS CHART IS READ AS FOLLOWS:

1-36 frequencies

0-100 score



100 efficiency

failure

Jan. 15	(Median	100
1929	(Mean	80.5%

Mar. 18	(Median	100
1929	(Mean	100%

CHART NO. 132

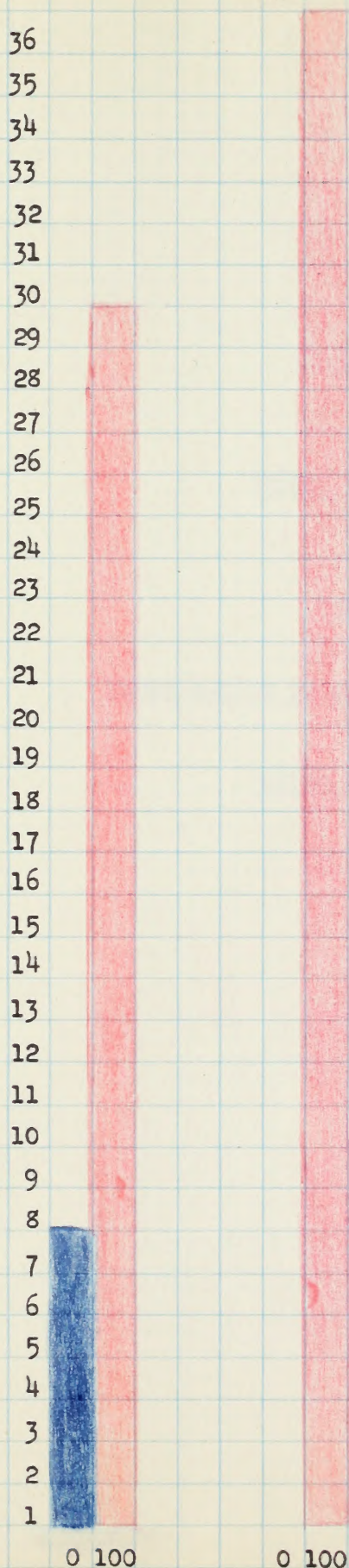








CHART NO. 133

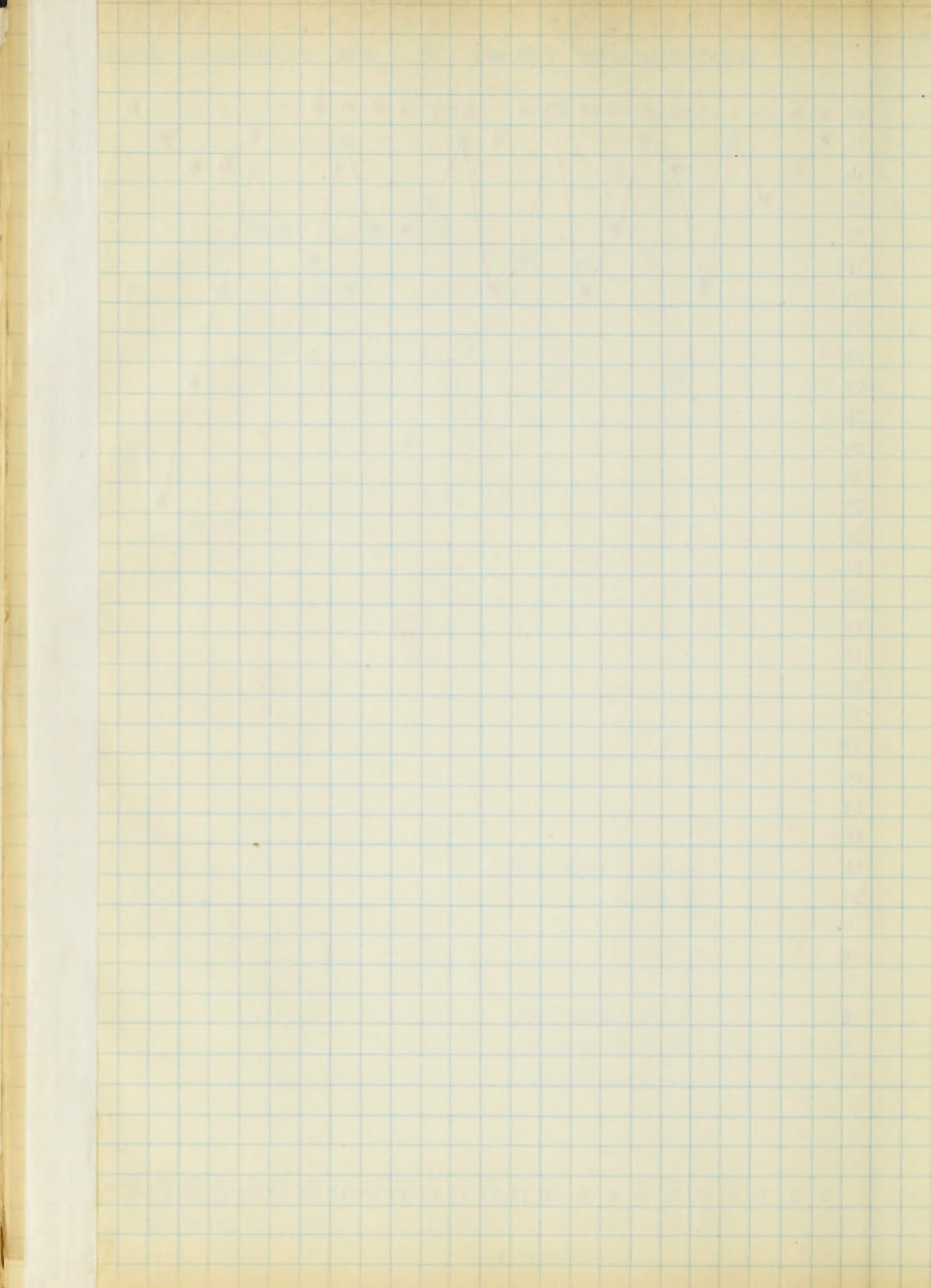
GRADE VI -- 36 PUPILS

SUMMARY

DISTRIBUTION TO SHOW PROGRESS TOWARDS 100% EFFICIENCY

USING PENALTY SCORE AS A BASIS







I. SUMMARIZED RESULTS IN TERMS OF MEDIAN AND MEAN

TO SHOW PROGRESSION IN LONG DIVISION WORK BOOK

AND DRILL SERVICE FIRST AND SECOND TRIAL - GRADE VI

II. SUMMARIZED RESULTS TO SHOW BY GROUPS GAINED

PROGRESSION IN MEDIAN AND MEAN - GRADE VI



# THE HISTORY OF GEOFFREY RAMSEY

OF THE

REIGN OF KING EDWARD THE FIRST

IN THE YEAR OF HIS AGE SIXTY

AND TWO OF HIS REIGN FORTY

BY JOHN RICHARDSON

OF THE CITY OF LONDON

PRINTED BY

JOHN RICHARDSON

1794



Group		: E x c e p t i o n s											
Set		X	<u>30</u>	<u>30</u>	<u>31</u>	<u>31</u>	:	<u>34</u>	<u>34</u>				
		29	1	2	1	2	:	32	33	1	2	35	36
Trial	(Median	100	100	100	100	100	:	100	100	100	100	100	100
I	(Mean	88.8	77.7	80.5	86.2	75.	:	86.2	94.4	86.2	75.0	83.3	80.5
:													
Trial	(Median	100	100	100	100	100	:	100	100	100	100	100	100
II	(Mean	100	100	100	100	100	:	100	100	100	100	100	100







LONG DIVISION DRILL SERVICE TABLE NO. XXIV

SHOWING BY GROUPS GAINED PROGRESSION IN THE MEDIAN AND MEAN

(See Charts No. 82-133)

GRADE VI

Group	MEDIAN			:	MEAN		
	1st Trial	2nd Trial	Gain		1st Trial	2nd Trial	Gain
I	100	100	---	:	92.9%	100%	7.1%
II	100	100	---	:	90.2%	99.4%	9.2%
III	100	100	---	:	83.3%	94.4%	11.1%
IV	100	100	---	:	75.0%	91.6%	16.6%
V	100	100	---	:	73.5%	97.2%	23.7%
VI	100	100	---	:	81.4%	97.2%	15.8%
VII	100	100	---	:	73.1%	97.2%	24.1%
VIII	100	100	---	:	61.1%	97.7%	36.6%
IX	100	100	---	:	75.8%	100%	24.2%
Exception	100	100	---	:	83.3%	100%	16.7%
X	100	100	---	:	76.5%	100%	23.5%
Excentions	100	100	---	:	84.2%	100%	15.8%







After completing the Work Book and Drill Service in Long Division, the second time, Grade V and VI showed a marked progression towards 100% efficiency.

(See Tables No. XXV - XXVI)

TABLE NO. XXV TO SHOW PROGRESSION IN THE ELIMINATION OF ERRORS

IN LONG DIVISION IN GRADE V AND VI

Group	1ST TRIAL		:	2ND TRIAL		:	TOTAL		:	% OF ERRORS ELIMINATED	
	Errors	Errors		Errors	Errors		Grade V	Grade VI		Grade V	Grade VI
I	179	34	:	2	0	:	181	34	:	99.8%	100%
II	143	51	:	9	2	:	152	53	:	93.8%	96.1%
III	47	7	:	2	2	:	49	9	:	95.8%	71.5%
IV	36	17	:	3	3	:	39	20	:	91.7%	82.4%
V	87	33	:	9	2	:	96	35	:	89.7%	94.0%
VI	125	16	:	20	3	:	145	10	:	84.0%	81.3%
VII	127	51	:	16	3	:	143	54	:	87.4%	94.2%
VIII	123	65	:	10	2	:	133	67	:	91.9%	96.9%
IX	132	38	:	11	0	:	143	38	:	91.7%	100%
Exceptions	71	16	:	3	0	:	74	16	:	95.8%	100%
X	188	70	:	34	0	:	222	70	:	82.0%	100%
Exceptions	119	34	:	11	0	:	130	34	:	90.9%	100%
TOTAL	1377	432	:	130	17	:	1507	449	:		

GRADE VI eliminated 96.1% of the errors of 1st trial

GRADE V " 90.6% " " " " " "

GRADE VI became 100% efficient on Groups I, IX, Exceptions to Rule I, X and Exceptions to Rule II on second trial. On the other groups 71.5% to 96.9% of all errors were eliminated

GRADE V on second trial from 82.4% to 99.8% of the errors on the groups were eliminated.



TABLE 1

Summary of the results of the investigation

for the year 1910

No. of cases		No. of deaths		No. of recoveries		No. of cures	
Total		Total		Total		Total	
100	100	10	10	90	90	80	80
200	200	20	20	180	180	160	160
300	300	30	30	270	270	240	240
400	400	40	40	360	360	320	320
500	500	50	50	450	450	400	400
600	600	60	60	540	540	480	480
700	700	70	70	630	630	560	560
800	800	80	80	720	720	640	640
900	900	90	90	810	810	720	720
1000	1000	100	100	900	900	800	800

Notes: The above figures are based on the results of the investigation for the year 1910.

The figures are given in the following order: Total, No. of deaths, No. of recoveries, No. of cures.

The figures are given in the following order: Total, No. of deaths, No. of recoveries, No. of cures.

The figures are given in the following order: Total, No. of deaths, No. of recoveries, No. of cures.

The figures are given in the following order: Total, No. of deaths, No. of recoveries, No. of cures.

The figures are given in the following order: Total, No. of deaths, No. of recoveries, No. of cures.

The figures are given in the following order: Total, No. of deaths, No. of recoveries, No. of cures.



TABLE NO. XXVI TO SHOW ELIMINATION OF INDIVIDUAL ERRORS IN GRADE V AND VI

		1ST TRIAL		2ND TRIAL		TOTAL		% OF ERRORS	
		E R R O R S		E R R O R S				E L I M I N A T E D	
GROUP		GRADE V	GRADE VI	GRADE V	GRADE VI	GRADE V	GRADE VI	GRADE V	GRADE VI
R U L E I	I	127	26	2	0	129	26	99.4%	100%
	II	110	35	9	2	119	37	91.9%	94.3%
	III	26	6	2	2	28	8	92.3%	66.6%
	IV	26	9	3	3	29	12	88.5%	66.6%
	V	60	19	9	2	69	21	85.4%	89.5%
	VI	100	18	20	3	120	21	80%	83.4%
	VII	77	27	16	3	93	30	79.3%	88.9%
	VIII	73	42	10	2	83	44	86.4%	95.3%
	IX	78	26	11	0	89	26	86.1%	100%
	Excep- tions	51	12	3	0	54	12	94.1%	100%
R U L E II	X	137	55	34	0	171	55	75.2%	100%
	Excep- tions	90	32	11	0	101	32	87.8%	100%
TOTAL ERRORS		955	307	130	17	1085	324		

GRADE VI eliminated 94.4% of the individual errors of 1st trial

GRADE V eliminated 86.3% of the individual errors of 1st trial.

GRADE VI eliminated all the individual errors in Group I, IX, Exceptions to Rule I, Group X and Exception to Rule II on the second trial. On the other groups from 66.6% to 95.3% of the individual errors were eliminated.

In GRADE V from 75% to 99.4% of the individual errors were eliminated.







CHECKING MASTERY OF LONG

DIVISION

SECOND TRIAL MARCH 19, 1929

SUMMARY



10/10/1914

10/10/1914

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10/10/1914



PROGRESSION TOWARD 100%  
EFFICIENCY ON SECOND TRIAL OF  
LONG DIVISION TEST 6P<sup>2</sup> IN  
GRADE V AND GRADE VI

(See Charts No. 134 - 137 )



THE  
UNITED STATES  
DEPARTMENT OF AGRICULTURE

REPORT OF THE

COMMISSIONER OF THE

GENERAL INVESTIGATION

OF THE

DEPARTMENT



It is noted that the majority of the data obtained in the North and South  
 studies, which were obtained by the use of the same methods, are  
 in good agreement with the results obtained by the use of the same methods  
 in the study of the same data.

The results showed that the data obtained in the North and South  
 studies are in good agreement with the results obtained by the use of the same  
 methods in the study of the same data.

On the basis of the data obtained in the North and South  
 studies, the following distribution of errors is obtained:

#### DISTRIBUTION OF ERRORS

On the basis of the data obtained in the North and South  
 studies, the following distribution of errors is obtained:

(SEE TABLE NO. XXVII - XXVIII.)

The data obtained in the North and South

studies are in good agreement

with the results obtained by the use of the same

methods in the study of the same data.

The data obtained in the North and South

studies are in good agreement with the results obtained by the use of the same

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The data obtained in the North and South

studies are in good agreement with the results obtained by the use of the same

methods in the study of the same data.

1870

1870

TABLE OF CONTENTS

(1870-1871)

1870-1871

1870-1871



In order to check the Mastery of Long Division in the Fifth and Sixth Grades, Wilson Process Inventory and Diagnostic Test of Long Division Test 6 P<sup>2</sup> was given March 19, 1929, using the Penalty Score as a Basis. (See Charts No. 134-137)

The results showed that Grade V - 67 pupils had made a great progress toward 100% efficiency. There were 54 errors on the second trial while there were 604 errors on the first trial.

On the first trial one pupil had no error while on the second trial 37 pupils had no errors. (See Distribution of Errors Tables No. XXVII-XXVIII)

On the first trial one example had no error while on the second trial 26 different examples had no errors.

The Class Median of Errors was 1.

The Class Mean of Errors was 1.6%.

67 pupils

50 examples  $\frac{54}{3350}$

54 errors

The Class Mean was 98.4% on the second trial and 82.8% on the first trial. Showing a progression toward 100% efficiency in the Mean of 15.6%.

Most Common Errors on Second Trial were:

45) \$31.50      67) 2707      98) 9016      31) 139996

Errors per pupil on Second Trial were:

37 pupils had no errors:

19 pupils failed on 1 example

4 pupils failed on 2 examples

2 pupils failed on 3 examples

2 pupils failed on 4 examples

2 pupils failed on 5 examples

On Second Trial 14 pupils failed a second time on the same examples.

It is to be noted that the amount of the ...

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45) $\overline{31.50}$  failed on both trials five times

98) $\overline{9016}$  " " " " twice

73) $\overline{2409}$  " " " " twice

67) $\overline{2707}$  " " " " three times

64) $\overline{32750}$  111) $\overline{8991}$  83) $\overline{76360}$  36) $\overline{139996}$  34) $\overline{2704}$  45) $\overline{3555}$  47) $\overline{4300}$

failed on both trials once.

#### Errors on Different Examples

45) $\overline{31.50}$  failed on seven times

98) $\overline{9016}$  failed on five times

67) $\overline{2707}$  31) $\overline{139996}$  failed on four times

45) $\overline{3555}$  74) $\overline{518370}$  failed on three times

32) $\overline{1312}$  30) $\overline{\$6.90}$  121) $\overline{148951}$  1122) $\overline{135762}$  131) $\overline{2751}$  26) $\overline{18460}$  83) $\overline{76360}$

70) $\overline{1740}$  66) $\overline{5214}$  failed on twice.

73) $\overline{2409}$  34) $\overline{2074}$  28) $\overline{392}$  52) $\overline{3588}$  32) $\overline{\$177.00}$  47) $\overline{4300}$  64) $\overline{32750}$

61) $\overline{5185}$  31) $\overline{6874}$  51) $\overline{5693}$  failed on once.

26 different examples had no errors or 52% of the examples on second trial had no errors by pupils of Grade V.

On the second trial of the Wilson Process Inventory and Diagnostic Test in Long Division Test 6 P<sup>2</sup>, March 19, 1929 Grade VI, 38 pupils, showed a great progress toward 100% efficiency. There were 22 errors on the second trial, while on the first test there were 222 errors.

On the first trial 1 pupil had no error while on second trial 25 pupils had no errors. (See Distribution of Errors Table No. )

On the first trial 4 different examples had no error while on the second trial 36 different examples had no error.

The Class Median of Errors was 2.

The Class Mean of Errors was 1.7%.

38 pupils	$\frac{22}{1900}$
50 examples	
22 Errors	

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The Class Mean was 99.3% on the second trial and 88.4% on the first trial. Showing a progression toward 100% Efficiency in the Mean of 10.9%

Most Common Errors on the Second Trial were:

32) $\overline{\$177.00}$  52) $\overline{3588}$  121) $\overline{148951}$  74) $\overline{518370}$  45) $\overline{3555}$  30) $\overline{\$6.90}$  14) $\overline{\$8.40}$   
81) $\overline{5508}$ .

Errors per pupil on Second Trial

11 pupils failed on one example:

74) $\overline{2740}$  52) $\overline{3588}$  59) $\overline{1357}$  14) $\overline{\$8.40}$  73) $\overline{3358}$  45) $\overline{3555}$  74) $\overline{518370}$   
39) $\overline{\$6.90}$  121) $\overline{148951}$  81) $\overline{5508}$  28) $\overline{392}$ .

1 pupil failed on two examples.

32) $\overline{\$177.00}$  14) $\overline{\$8.40}$

1 pupil failed on 9 examples

30) $\overline{\$6.90}$  45) $\overline{\$31.50}$  91) $\overline{3915}$  81) $\overline{5508}$  32) $\overline{\$177.00}$  74) $\overline{518370}$  52) $\overline{3588}$   
121) $\overline{148951}$  45) $\overline{3555}$

On second trial 5 pupils failed on the same example a second time.

Examples failed on a second time

52) $\overline{3588}$  30) $\overline{\$6.90}$  45) $\overline{\$31.50}$  32) $\overline{\$177.00}$  45) $\overline{3555}$  74) $\overline{518370}$  121) $\overline{148951}$

8 pupils made errors on different examples.

Errors on the Different Examples

6 different examples were failed on once

8 different examples were failed on twice.

36 different examples had no error.

72% of examples in this test on second trial had no errors by the pupils of Grade VI.

TABLE NO. XXIX SUMMARY OF TEST 6P<sup>2</sup> BY GRADES

(1st & 2nd Trial) Using Penalty Score as Basis (See Charts No. 134-137)									
Grade No.	Pupils	Median	of	Errors	:	Mean of Errors	:	Class Mean	
		1st Trial	2nd Trial	Gain	:	1st Trial	2nd Trial	Gain	1st Tr 2nd Tr Gain
V	67	:	11	1	10	17.2%	1.6%	15.6%	82.8% 98.4% 15.6%
VI	38	:	4	2	2	11.6%	1.7%	9.9%	88.4% 98.3% 10.9%





LONG DIVISION

WILSON PROCESS INVENTORY

AND DIAGNOSTIC TEST

TEST 6 P<sup>2</sup>

SECOND TRIAL MARCH 19, 1929

(See Charts No. 134-137)





TABLE NO. XXX TO SHOW GAINED PROGRESSION OF GROUPS IN THE MEDIAN

FIRST AND SECOND TRIALTEST 6 P<sup>2</sup> BY GRADES

<u>GRADE V</u>	<u>TEST 6 P<sup>2</sup></u>		<u>LONG DIVISION</u>
<u>GROUP</u>	<u>1ST TRIAL</u>	<u>2nd TRIAL</u>	<u>GAIN</u>
I	100	100	
II	100	100	
III	100	100	
IV	100	100	
V	100	100	
VI	100	100	
VII	100	100	
VIII	0	100	100
IX	100	100	
X	0	100	100
<u>GRADE VI</u>			
I	100	100	
II	100	100	
III	100	100	
IV	100	100	
V	100	100	
VI	100	100	
VII	100	100	
VIII	0	100	100
IX	0	100	100
X	100	100	





TABLE NO. XXXI TO SHOW GAINED PROGRESSION IN THE MEAN

FIRST AND SECOND TRIAL OF GROUPS IN TEST 6 P<sup>2</sup>BY GRADES

<u>GRADE V</u>	<u>TEST 6 P<sup>2</sup></u>	<u>LONG DIVISION</u>	
Group	1st Trial	2nd Trial	Gain
I	77.7%	91.1%	13.4%
II	75.0%	97.1%	22.1%
III	77.7%	97.1%	19.4%
IV	71.0%	86.7%	15.7%
V	61.0%	95.6%	34.6%
VI	63.9%	100%	36.1%
VII	62.4%	94.1%	31.7%
VIII	26.9%	92.5%	65.6%
IX	56.9%	80.6%	23.7%
X	43.0%	83.6%	40.6%
<u>GRADE VI</u>			
I	86.1%	94.7%	8.6%
II	83.3%	97.4%	14.1%
III	80.5%	100%	19.5%
IV	77.7%	94.7%	17.7%
V	77.7%	94.7%	17.7%
VI	52.7%	89.5%	36.8%
VII	58.3%	97.4%	39.1%
VIII	8.3%	92.1%	83.8%
IX	47.2%	94.7%	47.5%
X	58.3%	86.8%	28.5%

TABLE

1870-1871

1871-1872

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1873-1874

1874-1875

1875-1876

1876-1877

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GRADE V 67 PUPILS LONG DIVISION

DISTRIBUTION OF SCORE TO SHOW CLASS EFFICIENCY IN LONG DIVISION (PENALTY SCORE)

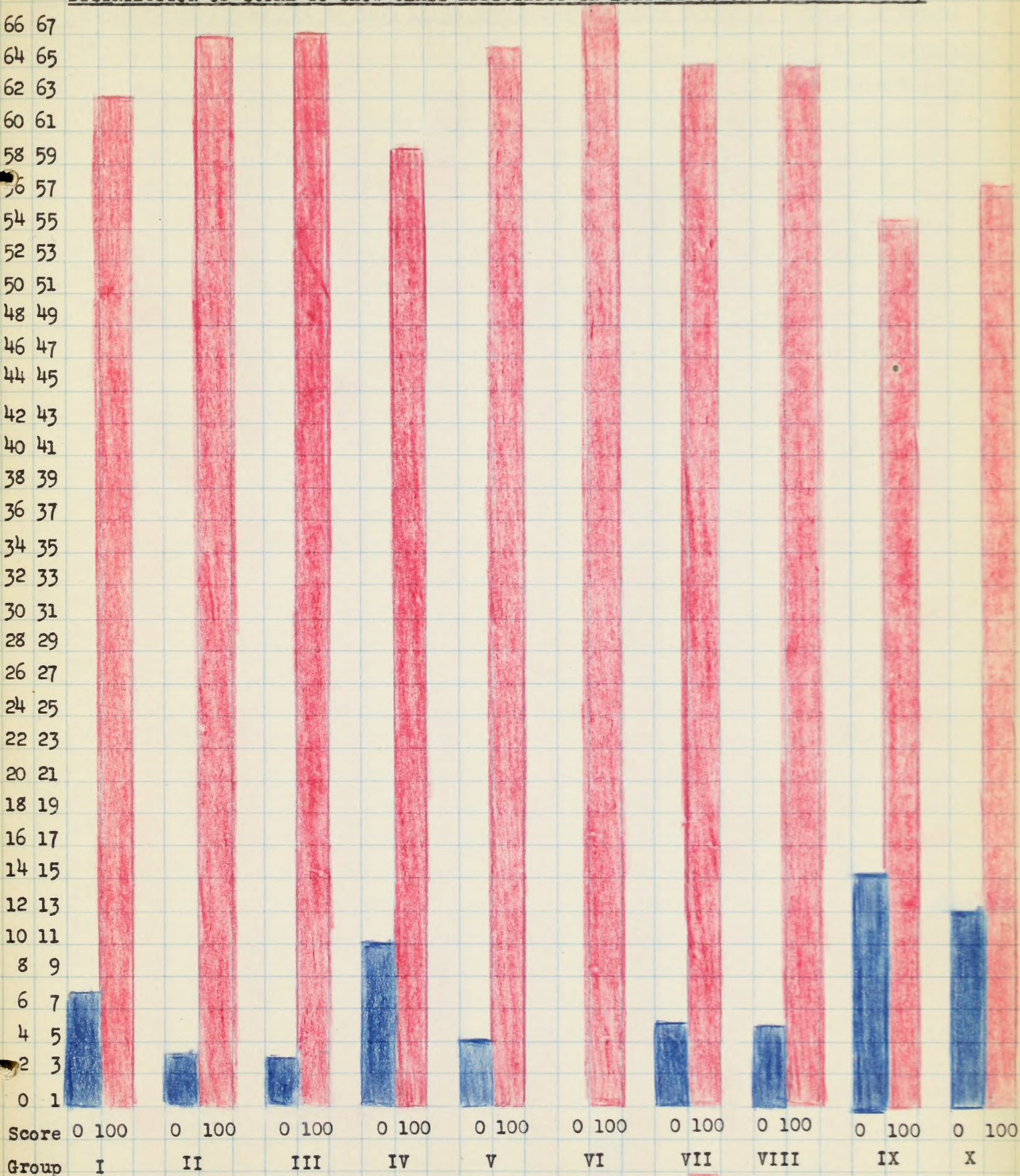
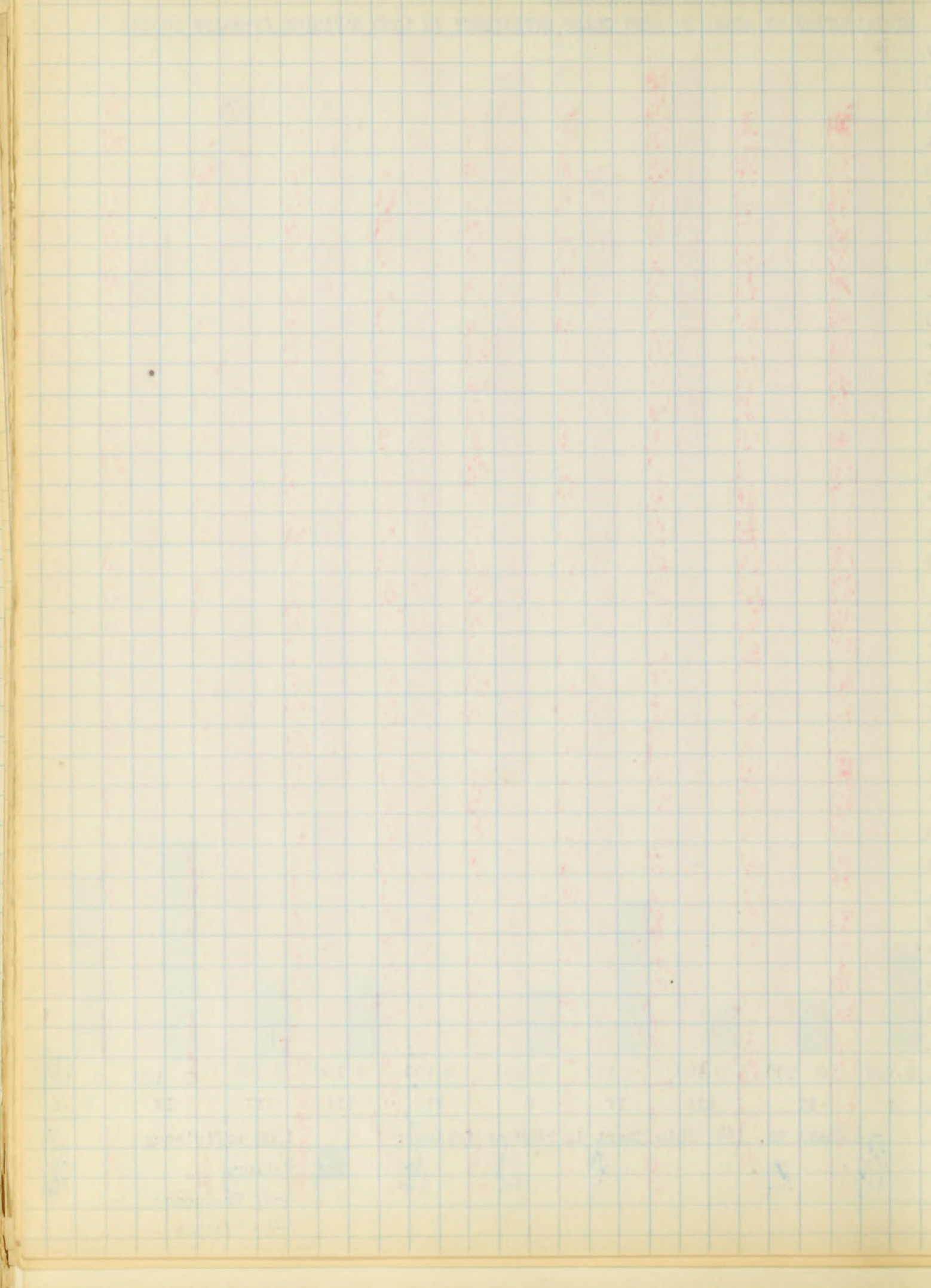


Chart No. 134 This Chart is read as follows:

100% efficiency  
failure  
0-67 frequency  
0-100 scores





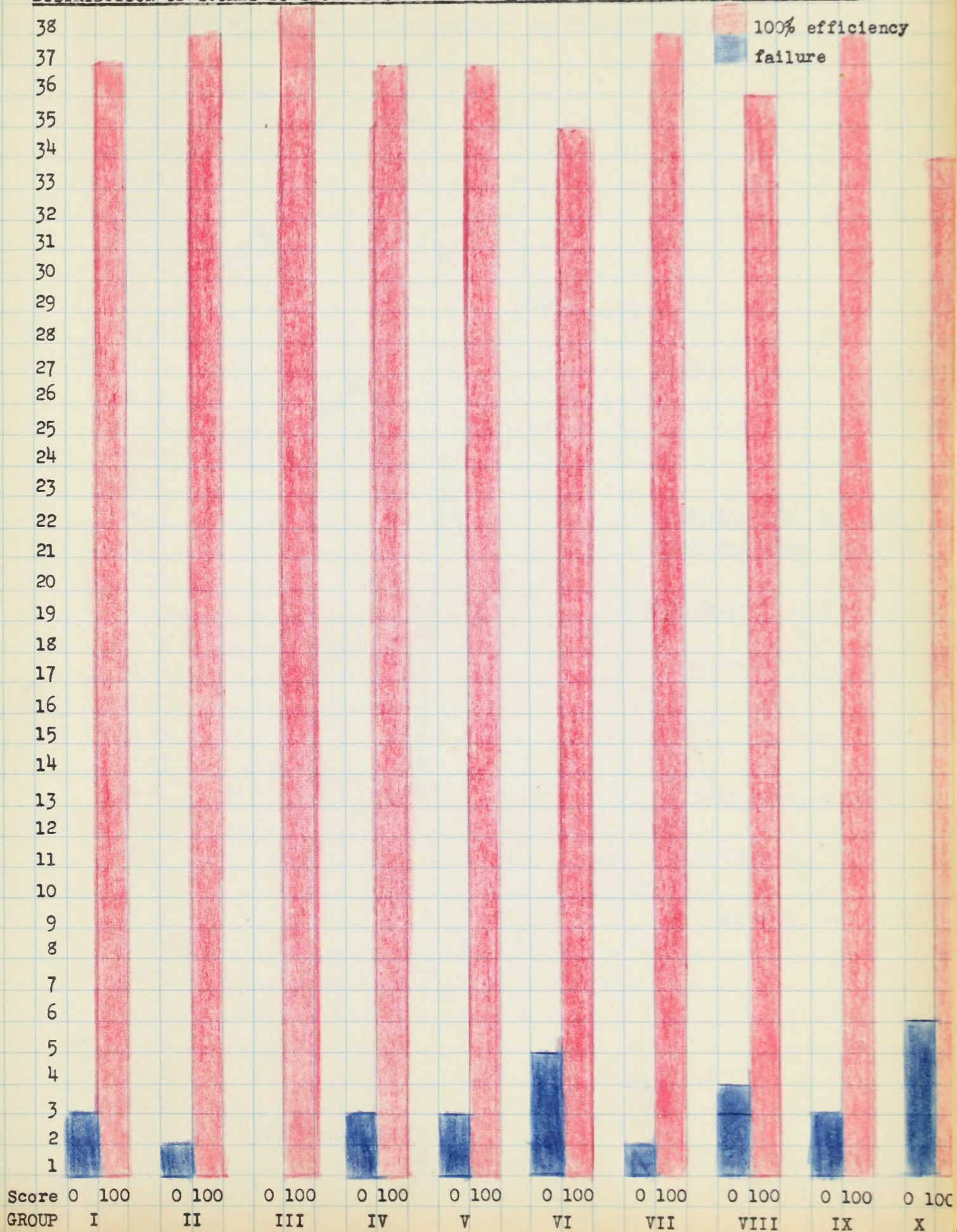


GRADE VI 38 Pupils

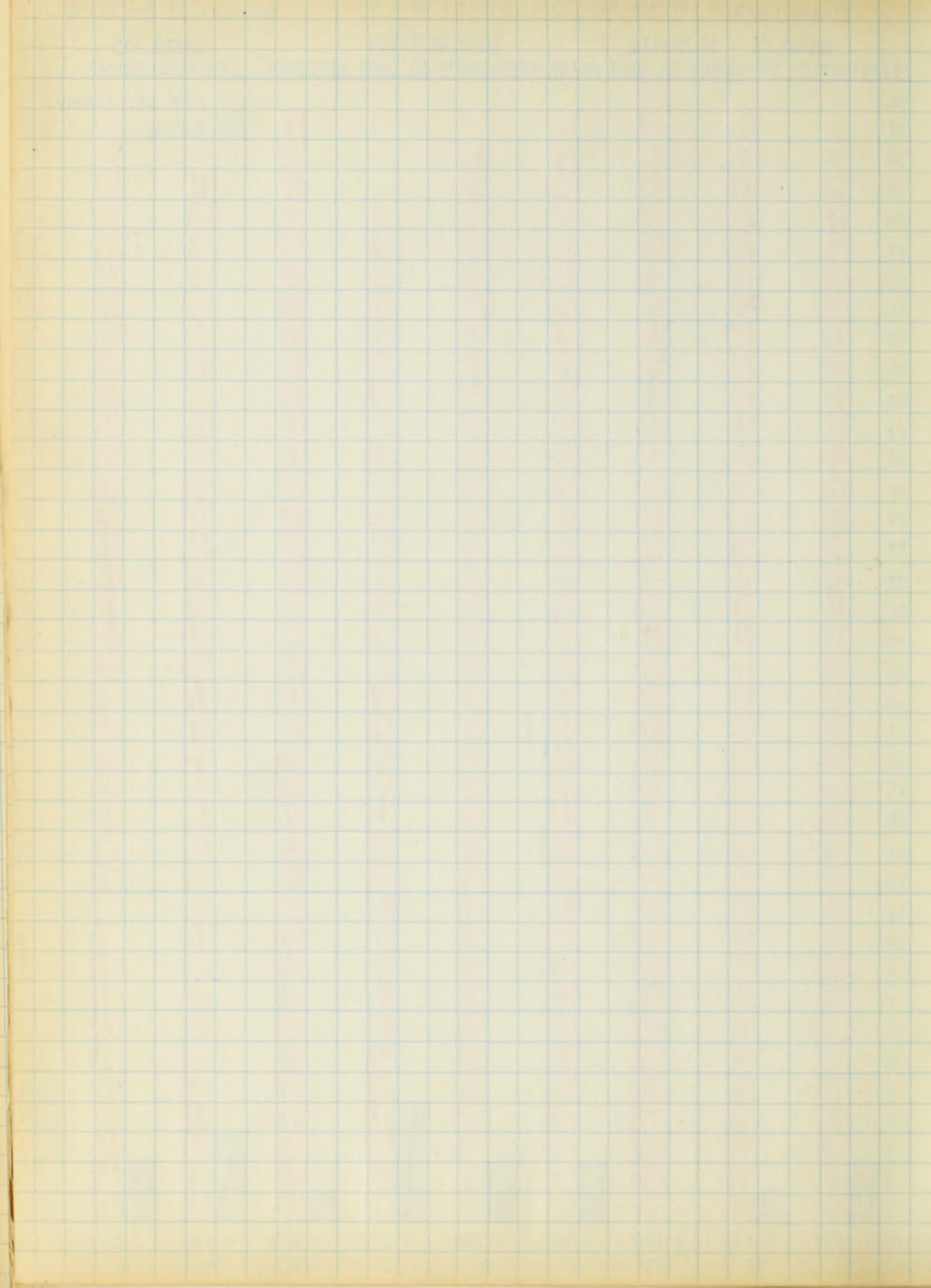
LONG DIVISION

Chart 135

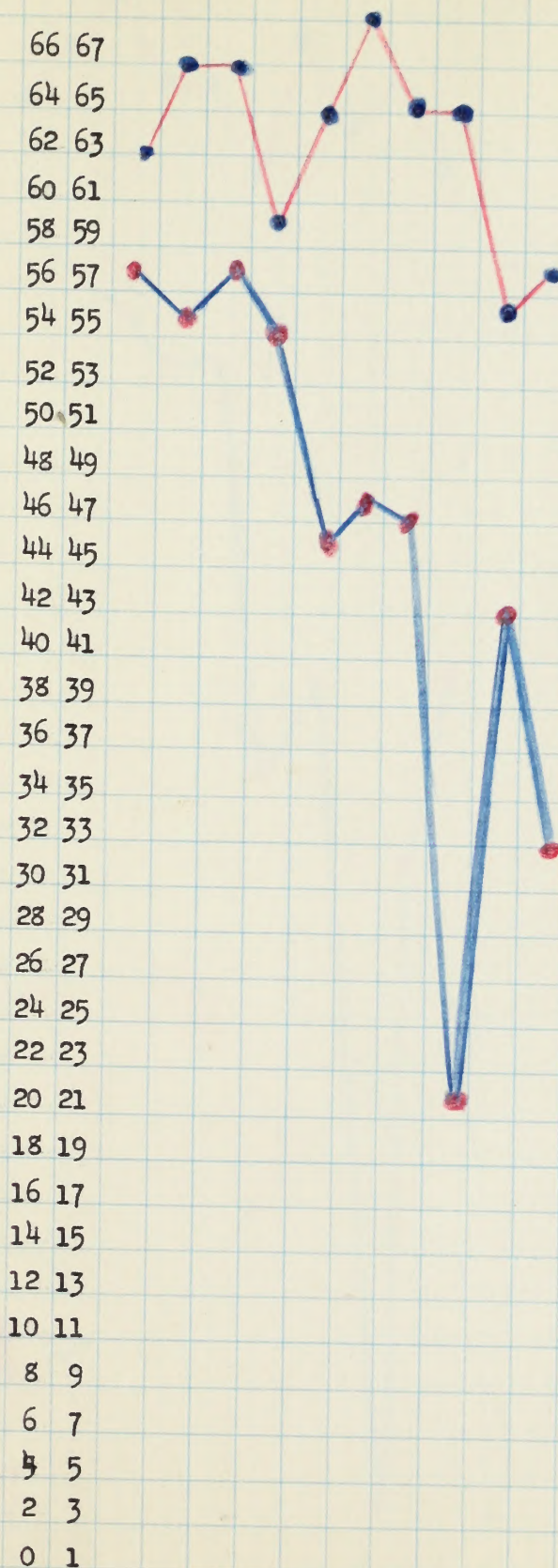
DISTRIBUTION OF SCORES TO SHOW CLASS EFFICIENCY IN LONG DIVISION (Penalty Score)










S U M M A R YG R A D E VDISTRIBUTION OF SCORES TO SHOW PROGRESSION TOWARDS 100% EFFICIENCY INLONG DIVISIONTEST 6 P<sup>2</sup> WILSON PROCESS INVENTORY AND DIAGNOSTIC TEST

FIRST TRIAL OCT. 15, 1928

SECOND TRIAL MAR. 19, 1929

THIS CHART IS READ AS FOLLOWS:

 FIRST TRIAL

 SECOND TRIAL

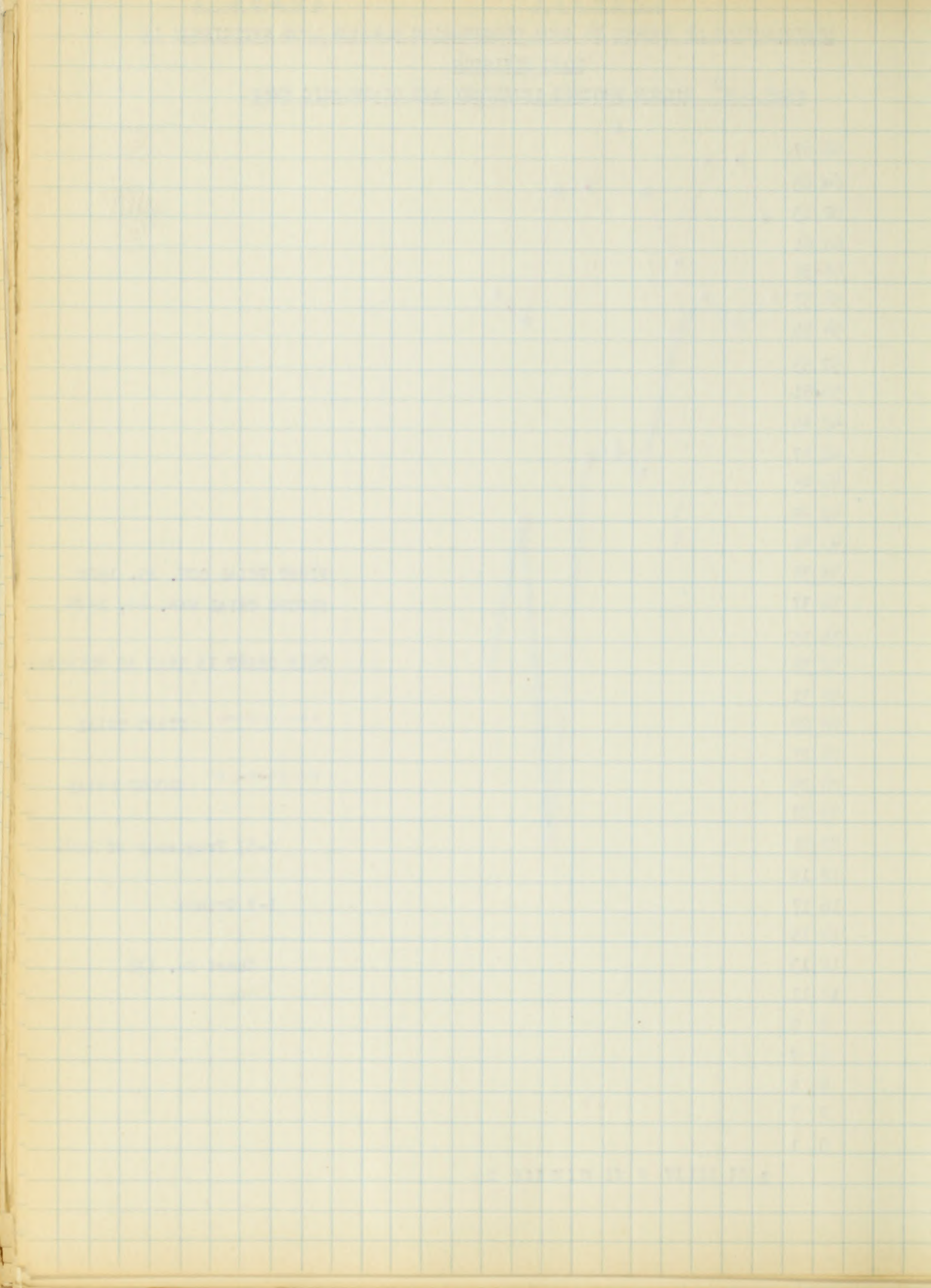
0-67 Frequency Of 100%

I-X Groups

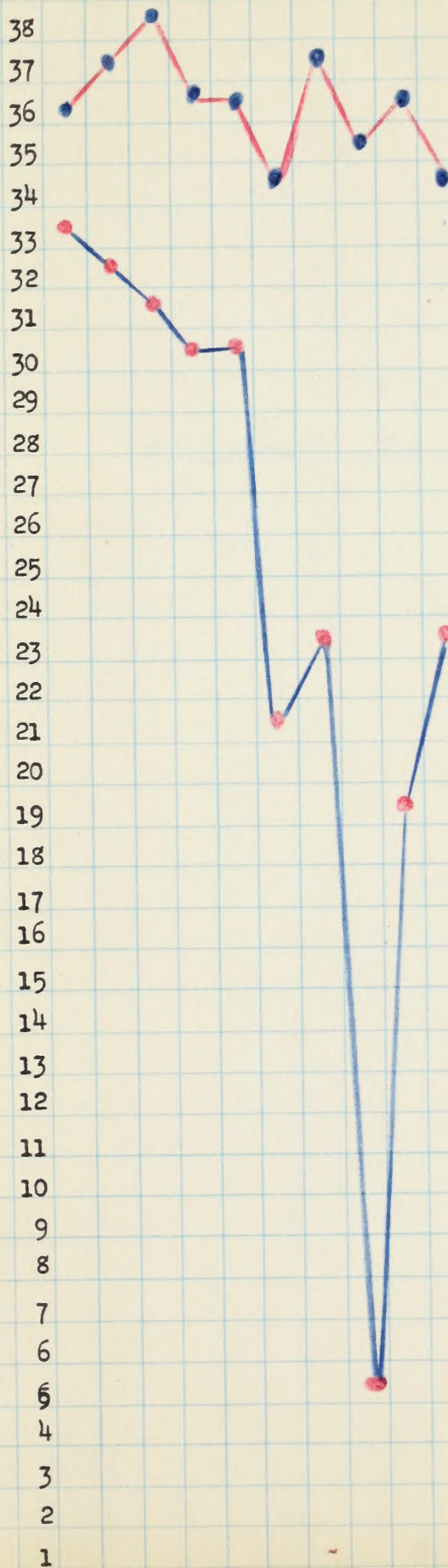
Chart No. 136

I II III IV V VI VII VIII IX X







S U M M A R YGRADE VIDISTRIBUTION TO SHOW PROGRESSION TOWARDS 100% EFFICIENCY IN LONG DIVISIONTEST 6 P<sup>2</sup> WILSON PROCESS INVENTORY AND DIAGNOSTIC TEST

FIRST TRIAL OCT. 15, 1928

SECOND TRIAL MAR. 19, 1929

THIS TABLE IS READ AS FOLLOWS:

—●— FIRST TRIAL

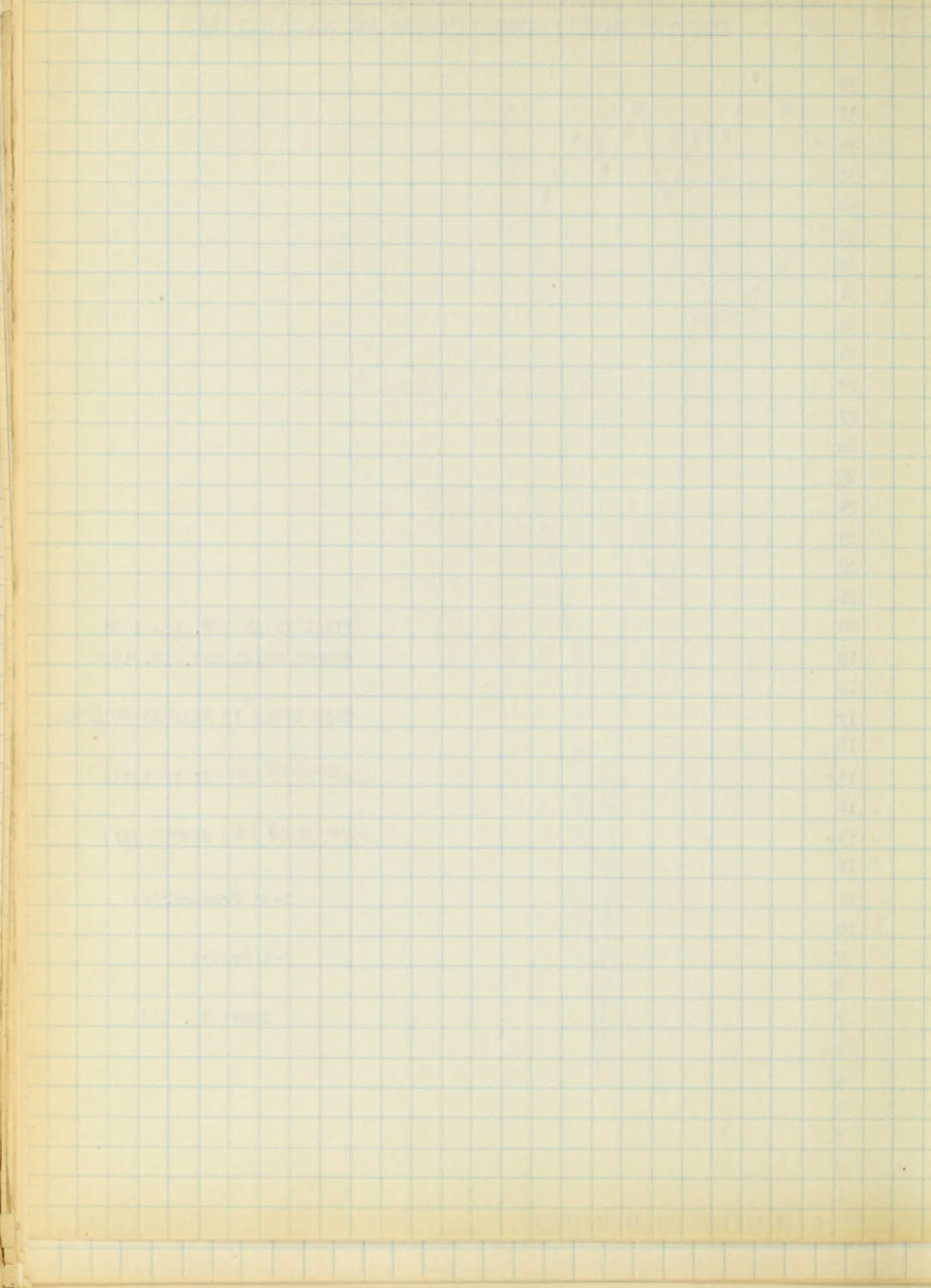
—●— SECOND TRIAL

1-38 Frequencies

I-X Groups

Chart No. 137







SUMMARY TO SHOW RESULTS





GENERAL SUMMARY

I? Small amounts of drill given frequently are more effective than large amounts given infrequently.

II. The surest way to prevent forgetting is to fight day by day, using a little time on the fundamental essentials.

III. The only remedial instruction worth while doing is that which is properly focalized on the precise skills and knowledges that have been shown to need it.

IV. Pupils should master certain fundamental number relations, such as the essentials subtraction and multiplication combinations before they are permitted to go further in their work.

V. The child himself must be thoroughly interested and motivated, and the teaching needs to be carefully and thoughtfully done on a helping basis.

VI. The skills and abilities developed during the period of remedial instruction were retained by the pupils.

VII. Pupils showed an increase in rate and accuracy on the fundamental combinations in subtraction, multiplication and short division.

VIII. The pupils' increased skill and accuracy helped them to progress in their regular daily class work of decimals and fractions.

IX. The slow and backward pupils made some appreciable progress.

X. A pupil furnished an opportunity will work until he reaches the limit of his ability.

XI. Teachers know that pupils are slow, but they do not locate the particular difficulty. This work was an aid to the teacher in detecting the specific deficiencies in the work of the pupils.

XII. Teachers should see that each child masters the fundamentals taught in her grade and also provide for an abundance of practice-drill, so that the abilities gained will be maintained.

XIII. The report from the teacher as to the quality of work of these pupils was very favorable.

XIV. The project showed the teacher: First, the tragic results of poor teaching. Second, the possibilities of diagnostic tests and remedial instruction in class room.

1. The first thing I noticed when I stepped out of the plane was the fresh air.

2. It felt like I had been in a bubble for the last few days.

3. The sun was shining brightly, and the birds were singing.

4. I took a deep breath and felt a sense of relief.

5. The road ahead was long, but I knew I was finally home.

6. I walked for hours, feeling the sun on my face.

7. The trees were tall and green, and the water was clear.

8. I saw a small village in the distance, and I knew I was close.

9. I walked faster, feeling a sense of purpose.

10. The sun was setting, and the stars were coming out.

11. I felt a sense of peace and tranquility.

12. I walked until I was tired, and then I fell asleep.

13. I woke up in the morning, feeling refreshed.

14. I walked for hours, feeling the sun on my face.

15. The trees were tall and green, and the water was clear.

16. I saw a small village in the distance, and I knew I was close.

17. I walked faster, feeling a sense of purpose.

18. The sun was setting, and the stars were coming out.

19. I felt a sense of peace and tranquility.

20. I walked until I was tired, and then I fell asleep.

21. I woke up in the morning, feeling refreshed.

22. I walked for hours, feeling the sun on my face.

23. The trees were tall and green, and the water was clear.

24. I saw a small village in the distance, and I knew I was close.

25. I walked faster, feeling a sense of purpose.

26. The sun was setting, and the stars were coming out.

27. I felt a sense of peace and tranquility.

28. I walked until I was tired, and then I fell asleep.



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in

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Boston University

Accuracy in the Fundamentals

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*Corrections:-  
P.P 6, 9, 10, 15, 16, 21.*

*Added:-  
answers to  
examples for  
Rule II - P.P 24-30*

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### The Drill Service.

The long division drill service which follows is developed under 10 groups. The work in Group I is very very simple. There will be no difficulties and it will afford you the opportunity of fixing the long division plan. Group 1 gives you 100 such examples you will enjoy doing them. The chances are that you will make few if any mistakes. However, you may make mistakes to start on. Watch carefully, follow the plan, and by the time you are through with these 100 examples try to have the plan fully in mind.

Groups II to IX continue work similar to Group I, except that each group introduces some new difficulty. Each group contains enough examples to enable a pupil to master the difficulty involved.

Group X opens up a new field, with a new rule and some exceptions to it. This is followed by further practice examples.

### Long Division Plan

A regular plan helps in any process. It helps in Addition, Subtraction, Multiplication, and Short Division, where the total facts are quite limited. But in Long Division the facts are not limited, so the plan of procedure becomes the whole thing.

We are calling Long Division any division with a divisor of 10 or above. Now 10 may be used as a divisor to 10, 11, 12, 13, 14, and on up to 1000; 100,000; or 100,000,000; or any amount. That is to say, the number of divisions is not limited. So there can be no complete table of facts in Long Division.

Since the plan in Long Division is the only guide, it must be simple and easily followed, yet complete enough to insure correct results. So we must make a plan, and the best way to make a plan is to first do the thing correctly and then note the steps taken in doing it. A plan is a statement of the steps taken in doing a thing correctly.





$$\begin{array}{r}
 231 \\
 21 \overline{) 4853} \\
 \underline{42} \phantom{00} \\
 65 \phantom{00} \\
 \underline{63} \phantom{00} \\
 23 \phantom{00} \\
 \underline{21} \phantom{00} \\
 2R
 \end{array}$$

What we did

1. Divide  
-Trial quotient  
Properly placed
2. Multiply  
-Compare
3. Subtract  
-Compare
4. Bring Down  
-Compare
5. Divide  
-Put a quotient figure dividend.  
Trial quotient,  
properly placed
6. Multiply
7. Subtract
8. Bring down
9. Divide
- 10 Multiply
- 11 Subtract
- 12 Note the remainder

We are dividing 4853 by 21. Write the numbers with the division brace. Then we begin to divide just as in short division. 21 will not go into 4, so we take 48. But we may use the first figure of 21 and the first figure of 48 for a trial divisor  $2 \overline{) 4}$ . The trial divisor 2 is contained in 4 twice. So 21 is likely contained in 48 twice. The 2 is chosen as trial quotient, and is written above the line as in short division, just above the last figure of the partial

We next multiply 21 by this trial quotient. It is always a trial quotient. Multiplying we get 42. Comparing we see that 42 appears to be correct, since it is a little less than 48.

The next step is to subtract. Comparing we find that the remainder 6, is less than 21 the divisor so the work so far is correct.

Bring down the next figure. Putting the 3 with the 6, we have 63





Now we take the same steps all over

again:

- Divide (trial quotient, properly placed)
- Multiply (Compare)
- Subtract (Compare)

Since the remainder is 2 and this is less than the divisor, the trial quotient 3 is correct.

A - Bring down

Again we take the same steps.

- Divide (trial quotient, properly placed)
- Multiply (compare)
- Subtract (compare, is there is any-left over.)

Since there is 2 left over, the trial quotient is correct.

Since there is nothing more to bring down, the 2 left over is noted as remainder by writing R. after it, and our work is complete except for checking the answer.

Checking the Answer in long division is done exactly as in short division. The answer or quotient is multiplied by the divisor and the remainder added. If the result is equal to the dividend,

$$\begin{array}{r}
 231 \text{ (quotient)} \\
 \times 21 \text{ (divisor)} \\
 \hline
 231 \\
 462 \\
 \hline
 4851 \\
 + 2 \text{ (remainder)} \\
 \hline
 4853
 \end{array}$$

the answer is correct. Let us do this. The work shows at the left. The result, 4853, is the same as the dividend, so the work is correct.

now we can see these things all over

again.

- The first (first) product, properly  
called,

- The second (second)

- The third (third)

Since the first is 1.2 and

this is less than the third,

the first product is correct.

A - First time

again we take the same steps.

- The first (first) product, properly  
called,

- The second (second)

- The third (third), is more than the

first one.

Since the first is 1.2 and the

second is 1.2, the first

product is correct.

Since the first is 1.2 and the

second is 1.2, the first

product is correct.

Since the first is 1.2 and the

second is 1.2,

the first product is correct.

Since the first is 1.2 and the

second is 1.2, the first

product is correct.

Since the first is 1.2 and the

second is 1.2, the first

product is correct.

1.2 (first)

1.2 (second)

1.2 (third)

1.2 (fourth)

1.2 (fifth)

1.2 (sixth)

1.2 (seventh)

1.2 (eighth)



Looking back at our work, we see that twelve steps were taken in solving this example. But study of these steps shows repetition. There are four steps and the others are all repetitions, until the last. So we get our plan for long division, and it is a very simple plan of four main steps as follows

1. Divide.  
-Trial quotient  
Properly placed.

These four steps are  
repeated over and over until

2. Multiply  
-Compare

there are no more figures to  
bring down.

3. Subtract  
-Compare

4. Bring down  
-Compare

Then there is a little extra step,-

5. Note the remainder by marking with R.

Then there is in long division as in all processes, the final step,-

6. Checking the answer.

There will be more to learn about some of these steps later, particularly about the trial quotient and a trial divisor. But for the present, these steps will be sufficient. In the exercises in the groups which follow immediately, there are no real difficulties, so improve the opportunity to master the Long Division Plan with its four main steps, one little extra step, and the final step, checking.





Long Division Drill Service

Graded Difficulties - Process Steps

Group I. Involving chiefly the form of operation in long division: divisor of two places and its right hand figure very small. No carrying in multiplication; no borrowing in subtraction; no remainders.

1. Dividing by 11.

- a. 11)21 b. 11)242 c. 11)363 d. 11)132 e. 11)253 f. 11)484  
 g. 11)5563 h. 11)5443 i. 11)1351 j. 11)1221 k. 11)1342  
 l. 11)2533 m. 11)4885 n. 11)2395 o. 11)2563 p. 11)1353  
 q. 11)2343 r. 11)2454 s. 11)3536 t. 11)113.75

2. Dividing by 21

- a. 21)210 b. 21)441 c. 21)294 d. 21)225.52 e. 21)4494 f. 21)23331  
 g. 21)444331 h. 21)23352 i. 21)25473 j. 21)23373

3. Dividing by 31.

- a. 31)341 b. 31)620 c. 31)651 d. 31)961 e. 31)3441  
 f. 31)6382 g. 31)3472 h. 31)3782 i. 31)96441 j. 31)65782

4. Dividing by 41, 51, 61, 71, 81.

- a. 51)561 b. 51)56361 c. 61)3771 d. 41)410 e. 41)4551  
 f. 41)455.92 g. 41)36961 h. 41)49651 i. 71)781 j. 81)3991

5. Dividing by 12, 13.

- a. 12)131 b. 12)15.72 c. 12)266.64 d. 12)38772 e. 13)169  
 f. 13)260 g. 13)15.73 h. 13)2769 i. 13)14456 j. 12)396





6. Dividing by 22.

22)242̄ b. 22)236̄ c. 22)740̄ d. 22)660̄ e. 22)880̄ f. 22)2662̄  
g. 22)2464̄ h. 22)4284̄ i. 22)43442̄ j. 22)28864̄

7. Dividing by 32.

a. 32)384̄ b. 32)960̄ c. 32)992̄ d. 32)3872̄ e. 32)6816̄  
f. 32)6784̄ g. 32)3584̄ h. 32)67552̄ i. 32)99552̄ j. 32)35584̄

8. Dividing by 42, 52, 62, 72, 82.

a. 42)44.62̄ b. 42)4662̄ c. 52)572̄ d. 52)5772̄ e. 62)682̄  
f. 62)6882̄ g. 72)720̄ h. 72)792̄ i. 72)7992̄ j. 82)820̄

9. Dividing by 23, 33.

a. 23)230̄ b. 23)299̄ c. 23)2783̄ d. 23)4899̄ e. 23)35531̄  
f. 33)396̄ g. 33)660̄ h. 33)3663̄ i. 33)6996̄ j. 33)36696̄

10. Dividing by 10.

a. 10)70̄ b. 10)30̄ c. 10)50̄ d. 10)90̄ e. 10)120̄ f. 10)110̄  
g. 10)710̄ h. 10)80̄ i. 10)1110̄ j. 10)1210̄

23)35581̄ ←

32)35584̄ ↗





Group II. Two place divisor, three or four place dividend, with remainder. No carrying or borrowing.

The work in long division which you have been doing in Group I is very simple, so simple that you can see each time just what you should do next. No rules were necessary. You followed the general plan and that was enough.

As the examples in long division get more difficult, it may be well to work out some helping rules. In an example like the one to the left, you could get your first quotient figure by

$$\begin{array}{r} 22 \\ 11 \overline{)242} \\ \underline{22} \phantom{2} \\ 22 \phantom{2} \\ \underline{22} \phantom{2} \end{array}$$

looking only at the first figure of the divisor and the first figure of the dividend,  $1 \overline{)2}$ . As the examples get more difficult you will learn to do this.

If the second figure of the divisor is small, the first figure may be thus used as a trial divisor and the results will usually be correct. Since this is true, we may make a rule for it. We will call it Rule 1. Here it is.

Rule I. When a two-figure divisor ends in 1, 2, 3, 4, or 5, use the first figure of the divisor as a trial divisor

There will be some exceptions to this rule, so you must help it by using the long division plan, including checking. But even so, the rule will help you. It helps most people a great deal, and it is for that reason that the rule is given to you: Try it out in the examples of Group II that follow.





1. Dividing by 11.

- a.  $11 \overline{) 122}$  b.  $11 \overline{) 33.66}$  c.  $11 \overline{) 488}$  d.  $11 \overline{) 555}$  e.  $11 \overline{) 688}$   
 f.  $11 \overline{) 26.66}$  g.  $11 \overline{) 1233}$  h.  $11 \overline{) 1455}$  i.  $11 \overline{) 3677}$  j.  $11 \overline{) 478.99}$   
 k.  $11 \overline{) 1455}$  l.  $11 \overline{) 2688}$  m.  $11 \overline{) 4688}$  n.  $11 \overline{) 579}$  o.  $11 \overline{) 4599}$   
 p.  $11 \overline{) 2477}$  q.  $11 \overline{) 1376}$  r.  $11 \overline{) 2599}$  s.  $11 \overline{) 2499}$  t.  $11 \overline{) 17.88}$

2. Dividing by 21.

- a.  $21 \overline{) 212}$  b.  $21 \overline{) 467}$  c.  $21 \overline{) 698}$  d.  $21 \overline{) 869}$  e.  $21 \overline{) 22.99}$   
 f.  $21 \overline{) 2566}$  g.  $21 \overline{) 4687}$  h.  $21 \overline{) 4498}$  i.  $21 \overline{) 6599}$  j.  $21 \overline{) 23.98}$

Dividing by 31.

- a.  $31 \overline{) 345}$  b.  $31 \overline{) 377}$  c.  $31 \overline{) 622}$  d.  $31 \overline{) 655}$  e.  $31 \overline{) 933}$   
 f.  $31 \overline{) 99.97}$  g.  $31 \overline{) 3442}$  h.  $31 \overline{) 6887}$  i.  $31 \overline{) 3475}$  j.  $31 \overline{) 3788}$

3. Dividing by 41, 51, 61, 71, 81.

- a.  $41 \overline{) 419}$  b.  $41 \overline{) 495}$  c.  $41 \overline{) 863}$  d.  $41 \overline{) 4559}$  e.  $41 \overline{) 86.98}$   
 f.  $51 \overline{) 561}$  g.  $61 \overline{) 674}$  h.  $71 \overline{) 78.87}$  i.  $81 \overline{) 812}$  j.  $81 \overline{) 996}$

4. Dividing by 12, 13.

- a.  $12 \overline{) 133}$  b.  $12 \overline{) 267}$  c.  $12 \overline{) 395}$  d.  $12 \overline{) 41.98}$  e.  $12 \overline{) 1454}$   
 f.  $12 \overline{) 2787}$  g.  $12 \overline{) 37.69}$  h.  $13 \overline{) 157}$  i.  $13 \overline{) 1445}$  j.  $13 \overline{) 16.76}$

5. Dividing by 22.

- a.  $22 \overline{) 245}$  b.  $22 \overline{) 32.89}$  c.  $22 \overline{) 467}$  d.  $22 \overline{) 689}$  e.  $22 \overline{) 888}$   
 f.  $22 \overline{) 2603}$  g.  $22 \overline{) 4884}$  h.  $22 \overline{) 46.88}$  i.  $22 \overline{) 3887}$  j.  $22 \overline{) 2487}$

Answer 3.14 - 1R.

$$\begin{array}{r} 222 - 1R \\ 22 \overline{) 4885} \end{array}$$





6 Dividing by 32.

- a.  $32 \overline{)324}$  b.  $32 \overline{)356}$  c.  $32 \overline{)33.87}$  d.  $32 \overline{)969}$  e.  $32 \overline{)999}$   
 f.  $32 \overline{)3554}$  g.  $32 \overline{)3878}$  h.  $32 \overline{)6817}$  i.  $32 \overline{)6735}$  j.  $32 \overline{)3589}$

*→ 32 ) 3589*

7. Dividing by 42, 52, 62, 72.

- a.  $42 \overline{)466}$  b.  $42 \overline{)4668}$  c.  $42 \overline{)464}$  d.  $52 \overline{)576}$  e.  $52 \overline{)5774}$   
 f.  $62 \overline{)688}$  g.  $62 \overline{)668.87}$  h.  $72 \overline{)795}$  i.  $72 \overline{)7997}$  j.  $72 \overline{)797}$

8. Dividing by 23, 33, 53, 63.

- a.  $23 \overline{)264}$  b.  $23 \overline{)257}$  c.  $23 \overline{)495}$  d.  $23 \overline{)225.87}$  e.  $33 \overline{)33.64}$   
 f.  $33 \overline{)695}$  g.  $33 \overline{)397}$  h.  $33 \overline{)3697}$  i.  $53 \overline{)585}$  j.  $63 \overline{)696}$

9. Dividing by 10.

- a.  $10 \overline{)112}$  b.  $10 \overline{)64}$  c.  $10 \overline{)125}$  d.  $10 \overline{)1352}$  e.  $10 \overline{)175}$   
 f.  $10 \overline{)96}$  g.  $10 \overline{)452}$  h.  $10 \overline{)687}$  i.  $10 \overline{)48}$  j.  $10 \overline{)965}$

*Answer III-5R*





Group III. First partial dividend requiring one more digit than  
divisor contains. No carrying or borrowing. With or without  
remainders.

The new thing in group III is that your trial divisor will not be contained in the first figure of the dividend. You must take two figures. This sometimes happens in short division as, for instance, when you were dividing  $5 \overline{)10}$ . The 5 was not contained in 1 so you took the first two figures and found the 5's in 10. It is very similar here except you might have instead  $5 \overline{)105}$ . In this case the entire 105 is used. Taking 5 as the trial divisor and dividing it into 10 you get 2 and this you use as a trial quotient, placing the 2 over the third figure of the dividend.

You may complete the work and get the answer including the remainder. Then you will want to check the results. In the examples which follow you will become quite familiar with this particular new feature.





a. 61)I281<sup>-</sup> b. 51)I127<sup>-</sup> c. 40)I286<sup>-</sup> d. 70)I483<sup>-</sup> e. 71)2987<sup>-</sup>  
 f. 53)649 g. 62)I987<sup>-</sup> h. 41)2739<sup>-</sup> i. 72)I594<sup>-</sup> j. 81)3646<sup>-</sup>  
 k. 42)I399<sup>-</sup> l. 21)I0975<sup>-</sup> m. 81)2595<sup>-</sup> n. 61)I067<sup>-</sup> o. 51)I079I<sup>-</sup>  
 p. 51)I8779<sup>-</sup> q. 21)10.92<sup>-</sup> r. 20)I7566<sup>-</sup> s. 72)2399<sup>-</sup> t. 80)I9340<sup>-</sup>  
 u. 52)I0987<sup>-</sup> v. 21)I074<sup>-</sup> w. 21)I235<sup>-</sup> x. 31)I459<sup>-</sup> y. 41)I278<sup>-</sup>  
 z. 22)I364<sup>-</sup> aa. 71)I491<sup>-</sup> bb. 31)10.91<sup>-</sup> cc. 41)10.91<sup>-</sup>  
 dd. 51)10.32<sup>-</sup> ee. 21)10.28.73<sup>-</sup> ff. 22)I166<sup>-</sup> gg. 61)I434<sup>-</sup>  
 hh. 82)I886<sup>-</sup> ii. 42)I386<sup>-</sup>





Group IV When the right hand figure of the divisor is larger, involving carrying in multiplication.

The new thing in group IV is that the multiplications are a little more difficult. However, this will not bother you because you know multiplication. Long division affords a great deal of opportunity for review in multiplication. In the examples which follow there will be carrying in multiplication, while in the previous groups I, II, III, there was no carrying in multiplication.

43)2257<sup>-</sup> b. 84)2785<sup>-</sup> c. 46)3787<sup>-</sup> d. 53)2885<sup>-</sup> e. 46)1978<sup>-</sup>  
 f. 64)2898<sup>-</sup> g. 55)2446<sup>-</sup> h. 73)1987<sup>-</sup> i. 82)1898<sup>-</sup> j. 57)1379<sup>-</sup>  
 k. 62)1566<sup>-</sup> l. 93)6889<sup>-</sup> m. 66)3464<sup>-</sup> n. 33)17879<sup>-</sup> o. 53)28859<sup>-</sup>  
 p. 84)4704<sup>-</sup> q. 95)7885<sup>-</sup> r. 67)4154<sup>-</sup> s. 75)6225<sup>-</sup> t. 93)6975<sup>-</sup>  
 u. 32)1998<sup>-</sup> v. 62)4774<sup>-</sup> w. 85)2997<sup>-</sup> x. 48)1164<sup>-</sup>

Group IV, when the first and second of the district is larger, including groups in relation.

The new thing in group IV is that of a subordination and a little more difficult. Some of the old and new are the same, you know subordination. Long division system is a lot of opportunity for review in subordination. In the system which takes time with it, working as subordination, while in the system groups I, II, III, there are no working in subordination.

1. Group I: subordination, a little more difficult.
2. Group II: subordination, a little more difficult.
3. Group III: subordination, a little more difficult.
4. Group IV: subordination, a little more difficult.
5. Group V: subordination, a little more difficult.



Group V Borrowing in subtraction. No carrying in multiplication.

The new feature in group V is that there is borrowing in subtraction. The third step in the long division plan calls for subtracting. This you know very well and you have been subtracting. In the examples which follow, the subtraction is a little more difficult frequently requiring borrowing, but since you know how to subtract, this will not bother you. You will see as you work along through this long division drill service that the various difficulties have been separated so that if you do have trouble, you can master them one at a time.

$$42)\overline{1722} \quad \text{b. } 24)\overline{3384} \quad \text{c. } 53)\overline{1721} \quad \text{d. } 51)\overline{3132} \quad \text{e. } 41)\overline{3444}$$

$$\text{f. } 91)\overline{1547} \quad \text{g. } 72)\overline{3168} \quad \text{h. } 94)\overline{1974} \quad \text{i. } 62)\overline{2046}$$

$$\text{j. } 92)\overline{1104} \quad \text{k. } 83)\overline{2573} \quad \text{l. } 42)\overline{13511} \quad \text{m. } 61)\overline{5191}$$

$$\text{n. } 92)\overline{2024} \quad \text{o. } 43)\overline{1379} \quad \text{p. } 43)\overline{1371} \quad \text{q. } 71)\overline{3821}$$

$$\text{r. } 32)\overline{1031} \quad \text{s. } 63)\overline{7023} \quad \text{t. } 43)\overline{9124} \quad \text{u. } 51)\overline{2312}$$





Group VI Exercises involving both carrying (in multiplication) and borrowing (in subtraction).

Group VI gives you a few examples in which there is both carrying in multiplication and borrowing in subtraction.

- a.  $96 \overline{)4032}$       b.  $65 \overline{)1040}$       c.  $74 \overline{)5041}$       d.  $53 \overline{)2921}$       9?
- e.  $69 \overline{)2912}$       f.  $77 \overline{)25031}$       g.  $99 \overline{)8019}$       h.  $54 \overline{)3510}$
- i.  $54 \overline{)3402}$       j.  $85 \overline{)2811}$       k.  $94 \overline{)35131}$       l.  $45 \overline{)1132}$
- m.  $83 \overline{)2158}$       n.  $82 \overline{)52132}$       o.  $64 \overline{)2114}$       p.  $53 \overline{)3421}$
- q.  $74 \overline{)4524}$       r.  $65 \overline{)35441}$       s.  $66 \overline{)28116}$       t.  $44 \overline{)1852}$
- u.  $46 \overline{)1531}$       v.  $86 \overline{)2723}$       w.  $52 \overline{)2341}$       x.  $33 \overline{)11064}$

$$\begin{array}{r} 65 \\ 54 \overline{)3510} \end{array}$$

*If the dividend is changed the answer will also change.*

$$\begin{array}{r} 72 - 22R \\ 54 \overline{)3910} \\ \underline{378} \\ 130 \\ \underline{108} \\ 22 \end{array}$$





Group VII Easy exercises with more than two figures in divisor.

In ordinary business you will seldom need a divisor of more than two figures. However, sometimes you do. The examples in group VII give you drill in using divisors of more than two figures.

- 323)6783<sup>-</sup>    b. 221)4862<sup>-</sup>    c. 211)6752<sup>-</sup>    d. 321)3873<sup>-</sup>  
 e. 131)28955<sup>-</sup>    f. 232)5356<sup>-</sup>    g. 121)2796<sup>-</sup>    h. 311)9774<sup>-</sup>  
 i. 213)4697<sup>-</sup>    j. 223)4784<sup>-</sup>    k. 247)82640<sup>-</sup>    l. 152)34167<sup>-</sup>  
 m. 114)2649<sup>-</sup>    n. 131)27786<sup>-</sup>    o. 333)6993<sup>-</sup>    p. 222)6987<sup>-</sup>  
 q. 1112)26698<sup>-</sup>    r. 112)25998<sup>-</sup>    s. 211)88965<sup>-</sup>    t. 313)37897<sup>-</sup>  
 u. 212)2968<sup>-</sup>    v. 232)4994<sup>-</sup>    w. 100)400<sup>-</sup>    x. 100)2700<sup>-</sup>  
 y. 100)4552<sup>-</sup>    z. 100)485<sup>-</sup>    aa. 1000)4000<sup>-</sup>    bb. 100)6790<sup>-</sup>

$$\begin{array}{r}
 \sqrt{23-20R} \\
 232 \overline{)5356} \\
 \underline{464} \phantom{00} \\
 716 \phantom{00} \\
 \underline{696} \phantom{00} \\
 20
 \end{array}$$

$$\begin{array}{r}
 21-101R \\
 223 \overline{)4784} \\
 \underline{446} \phantom{00} \\
 324 \phantom{00} \\
 \underline{223} \phantom{00} \\
 101
 \end{array}$$

These accounts will show the same

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In ordinary business the bill is not a receipt  
and does not show the amount paid for the goods  
in return. It also does not show the amount of the  
bill.

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Group VIII Dividend zeros, unit's or ten's place, or both.

The new item in group VIII is the appearance of zero in the dividend. In general, you treat zero as any other figure. Where money is involved, zeros come in very frequently, hence special drill on zeros in the dividend is justified.

- |                           |                             |                           |                             |
|---------------------------|-----------------------------|---------------------------|-----------------------------|
| a. $75 \overline{)62400}$ | b. $97 \overline{)30780}$   | c. $88 \overline{)29500}$ | d. $451 \overline{)235600}$ |
| e. $65 \overline{)2150}$  | f. $74 \overline{)24600}$   | g. $224 \overline{)6990}$ | h. $95 \overline{)297600}$  |
| i. $52 \overline{)17800}$ | j. $429 \overline{)159900}$ | k. $52 \overline{)6100}$  | l. $312 \overline{)85230}$  |
| m. $42 \overline{)30830}$ | n. $36 \overline{)14800}$   | o. $24 \overline{)3150}$  | p. $82 \overline{)682.00}$  |
| q. $75 \overline{)48300}$ | r. $623 \overline{)10400}$  | s. $56 \overline{)2980}$  | t. $864 \overline{)79900}$  |

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The first of these is the fact that the  
the district. In general, the first  
there were in 1880, and the second  
the district is 1880.

1. 1880	2. 1880	3. 1880	4. 1880
5. 1880	6. 1880	7. 1880	8. 1880
9. 1880	10. 1880	11. 1880	12. 1880
13. 1880	14. 1880	15. 1880	16. 1880
17. 1880	18. 1880	19. 1880	20. 1880



Group IX      Quotient zeros.

The quotient zero is a real difficulty, that is, unless you have a plan. If you have a plan, however, and if you have learned it well and if you have learned to follow it carefully, the zero in the quotient will not be any more difficult than any other figure in the quotient. The point is that after you bring down a figure from the dividend to your partial dividend, you must always put a figure in the quotient. If the divisor is not contained in the partial dividend after you have brought down the extra figure then you must put down a zero before bringing down another figure. Notice the illustration at the left.

Illustration

$$\begin{array}{r}
 105 \\
 22 \overline{)2310} \\
 \underline{22} \phantom{0} \\
 110 \\
 \underline{110} \\
 0
 \end{array}$$

Take the example 22)2310. The first quotient figure is 1. After subtracting, 1 is left. Bringing down the next figure 1 gives a partial dividend of 11. But this is less than 22.

But a figure must be placed in the quotient for each figure brought down. The quotient figure must therefore be zero. After placing the quotient figure, the next figure of the dividend is brought down, giving 110 for the partial dividend. Into this 22 will go 5 times. Using 5 as trial quotient, the work is completed without a remainder.





Notice another illustration, and remember that the main point is that for each dividend figure brought down, there must be a figure placed in the quotient.

$$\begin{array}{r} 120 \\ 22 \overline{) 2644} \\ \underline{22} \phantom{00} \\ 44 \\ \underline{44} \\ 0 \text{ R.} \end{array}$$

In dividing 2644 by 22, the first quotient figure is 1. The remainder is 4. Bringing down the next figure, we have 44. The quotient figure

for this is 2.  $2 \times 22 = 44$ . There is no remainder. But there is one more figure in the dividend to bring down.

The 4 is brought down, but 22 will not go into 4.

A zero is placed in the quotient and 4 is noted as a remainder.

- |                              |                             |                              |                             |
|------------------------------|-----------------------------|------------------------------|-----------------------------|
| a. $78 \overline{) 7909}$    | b. $102 \overline{) 10507}$ | c. $85 \overline{) 87010}$   | d. $221 \overline{) 45987}$ |
| e. $341 \overline{) 35897}$  | f. $321 \overline{) 75317}$ | g. $524 \overline{) 576118}$ | h. $32 \overline{) 6666}$   |
| i. $753 \overline{) 378917}$ | j. $74 \overline{) 26340}$  | k. $85 \overline{) 9021}$    | l. $23 \overline{) 4370}$   |
| m. $34 \overline{) 14303}$   | n. $86 \overline{) 26435}$  | o. $82 \overline{) 49514}$   | p. $65 \overline{) 79092}$  |
| q. $542 \overline{) 218140}$ | r. $58 \overline{) 3926}$   | s. $821 \overline{) 32920}$  | t. $73 \overline{) 44218}$  |
| u. $75 \overline{) 22963}$   | v. $91 \overline{) 22733}$  |                              |                             |





EXCEPTIONS TO RULE I

Rule I teaches that when the second figure of a two-place divisor is small (1, 2, 3, 4, or 5) it may be more or less neglected in finding the trial quotient. That is, by using the first figure of the divisor as a trial divisor, and by dividing it into the first figure of the dividend, a trial quotient is secured and that is usually correct.

It will pay to study this rule further. Suppose you are dividing by 21. Take all of the cases giving 1 as quotient, in order to see how fully Rule 1 applies.  $21 \overline{)21}$  is the first case giving one as an answer. Here Rule I applies.  $2 \overline{)2}$  gives 1 as trial quotient, and this is the true quotient. Continue the other cases,-

$21 \overline{)22}$     $21 \overline{)23}$     $21 \overline{)24}$     $21 \overline{)25}$     $21 \overline{)26}$     $21 \overline{)27}$     $21 \overline{)231}$   
 $21 \overline{)29}$     $21 \overline{)30}$     $21 \overline{)31}$     $21 \overline{)32}$     $21 \overline{)33}$     $21 \overline{)34}$     $21 \overline{)35}$   
 $21 \overline{)36}$     $21 \overline{)37}$     $21 \overline{)38}$     $21 \overline{)39}$    To this point the trial quotient is the true quotient, although the remainder gets larger and larger.

But the answer is not 2 until we reach 42, so there are two more cases to consider, as follows,-  $21 \overline{)40}$     $21 \overline{)41}$   
 In these two cases Rule I falls down, for  $2 \overline{)4}$  gives 2, as trial quotient, and this is wrong. The answer to  $21 \overline{)40}$  is 1-19R, and the answer to  $21 \overline{)41}$  is 1-20R.

Thus you see that in the twenty-one cases of dividing 21 into 21, 22, on to 41, Rule I works in 19 cases, and fails in 2 cases. It will always fail in some cases.





Try 22 into 22 to 43, and note the number of cases in which Rule I works, the number in which it fails. So for 23 into 23 to 45; 24 into 24 to 47; 25 into 25 to 49. If you will do this carefully, you will begin to see that no general rule in long division can always work. We must, therefore, depend upon a plan and checking the answer.

You will be interested in solving the following examples, illustrating exceptions to Rule I.

Exceptions to Rule I.

21)40 b. 21)41 c. 22)40 d. 22)418 e. 22)418

f. 23)45 g. 24)46 h. 24)432 i. 21)409 j. 23)630

k. 32)618 l. 21)410 m. 24)440 n. 41)81 o. 42)1218

p. 22)430 q. 51)2029 r. 4)2107 s. 52)1028 t. 61)3602

u. 22)420 v. 62)4898 w. 72)1438 x 81)1610 y. 25)462

z. 24)408

$$\begin{array}{r} \checkmark 22 \overline{)430} \quad 19-12R. \\ \underline{22} \phantom{0} \\ 210 \\ \underline{198} \\ 12 \end{array}$$

$$\begin{array}{r} \checkmark 23 \overline{)418} \quad 18-4R. \\ \underline{23} \phantom{0} \\ 185 \\ \underline{184} \\ 1 \end{array}$$

*Answers on Page 38 are numbered incorrectly*

*Example d. is repeated in e.*

*Better use 23 for the divisor in e*





Group X When the trial quotient is not the true quotient.

In the easy cases of long division you use the first figure of the divisor as a trial divisor. When dividing  $21\overline{)441}$ , you divide 2 into 4 for your trial divisor. You get 2, and this proves to be correct. This rule is usually correct when the right hand figure of the divisor is small.

But when the right hand figure of a two-place divisor is large, it is different. This you will easily understand. Suppose you are dividing by 29. How many 29's in 120? Since 29 is almost the same as 30, there will be about the same number of each in 120. You see that there are 4 30's in 120. So there will, no doubt, be 4 29's.

Try it.

$$\begin{array}{r} 4 \\ 29\overline{)120} \\ \underline{116} \\ 4R. \end{array}$$

Since 4 is less than 29, the answer is apparently correct. Prove by checking.

Try another. Divide 161 by 38. First think of 38 as 40. Then think  $16 \div 4 = 4$ . Use 4 as the quotient figure. Multiply 38 by 4. Subtract. The remainder is 9. Since this is less than 38, the answer is right.

Prove by checking.

$$\begin{array}{r} 4 \\ 38\overline{)161} \\ \underline{152} \\ 9R. \end{array}$$

Use the same method of estimating the quotient figure whenever you divide by 26, 27, 28, or by 36, 37, or by 76, 77, 78, 79, or by any other two-place divisor ending in 6, 7, 8, or 9.

What figure do you use as trial divisor, if the divisor is 68? 89? 97? 46? 58?





Rule II When a two-figure divisor ends in 6, 7, 8, or 9, use the first figure increased by 1 as trial divisor. Use Rule II in the following examples.

a.  $28 \overline{) 9072}$       b.  $49 \overline{) 10652}$       c.  $88 \overline{) 21828}$       d.  $56 \overline{) 210408}$

e.  $56 \overline{) 27048}$       f.  $49 \overline{) 371}$       g.  $68 \overline{) 24112}$       h.  $59 \overline{) 1071}$

i.  $99 \overline{) 1804}$       j.  $37 \overline{) 1650}$       k.  $36 \overline{) 162}$       l.  $69 \overline{) 500}$

m.  $87 \overline{) 41216}$       n.  $66 \overline{) 2906}$       o.  $79 \overline{) 9600}$       p.  $18 \overline{) 4200}$

q.  $36 \overline{) 130}$       r.  $59 \overline{) 132}$       s.  $29 \overline{) 98}$       t.  $49 \overline{) 350}$

u.  $37 \overline{) 131}$       v.  $68 \overline{) 235}$       w.  $48 \overline{) 260}$       x.  $48 \overline{) 352}$

y.  $38 \overline{) 162}$       z.  $86 \overline{) 270}$       aa.  $49 \overline{) 255}$       bb.  $87 \overline{) 630}$

THE ... OF ...  
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a.  $68 \overline{)563}$       b.  $29 \overline{)927}$       c.  $77 \overline{)1670}$       d.  $58 \overline{)3780}$

e.  $66 \overline{)560}$       f.  $37 \overline{)800}$       g.  $37 \overline{)2420}$       h.  $39 \overline{)810}$

i.  $78 \overline{)1675}$

Use the first figure of the divisor increased by 1, as trial divisor. But do not fail to compare after you multiply and after you subtract.

a.  $78 \overline{)5796}$       b.  $27 \overline{)6090}$       c.  $29 \overline{)9604}$       d.  $38 \overline{)8159}$

e.  $28 \overline{)9789}$       f.  $19 \overline{)5275}$       g.  $28 \overline{)152}$       h.  $19 \overline{)83}$

i.  $68 \overline{)212}$       j.  $48 \overline{)513}$       k.  $98 \overline{)1430}$       l.  $28 \overline{)2738}$

m.  $39 \overline{)1235}$       n.  $79 \overline{)4910}$       o.  $19 \overline{)14009}$       p.  $97 \overline{)48212}$





- a. 47)5902<sup>-</sup>    b. 68)9801<sup>-</sup>    c. 29)6015<sup>-</sup>    d. 87)2754<sup>-</sup>
- e. 89)2780<sup>-</sup>    f. 48)1580<sup>-</sup>    g. 49)3602<sup>-</sup>    h. 56)4425<sup>-</sup>
- i. 96)21019<sup>-</sup>    j. 99)34800<sup>-</sup>    k. 59)1900<sup>-</sup>    l. 67)2198<sup>-</sup>
- m. 77)4901<sup>-</sup>    n. 78)4823<sup>-</sup>    o. 86)48498<sup>-</sup>    p. 98)21679<sup>-</sup>
- q. 59)24095<sup>-</sup>    r. 38)24252<sup>-</sup>    s. 38)16512<sup>-</sup>    t. 59)37799<sup>-</sup>

Exceptions to Rule II. Exception No. I.

Most rules have some exceptions. But a rule helps if it covers most cases. When a rule fails, you must fall back on your general plan which includes careful comparison and study of each step.

Let us study this matter by taking an example. Divide 119 by 29. Rule II tells us to use 2 increased by 1 as trial divisor

$$\begin{array}{r} 3 \\ 29 \overline{)119} \\ \underline{87} \\ 32 \end{array}$$

Dividing, we get 3 as our trial quotient.

Multiplying,  $3 \times 29 = 87$

Comparing we see that 87 is less than 119, so we procede.

1. 1870-1871. 1. 1870-1871. 1. 1870-1871.

2. 1871-1872. 2. 1871-1872. 2. 1871-1872.

3. 1872-1873. 3. 1872-1873. 3. 1872-1873.

4. 1873-1874. 4. 1873-1874. 4. 1873-1874.

5. 1874-1875. 5. 1874-1875. 5. 1874-1875.

6. 1875-1876. 6. 1875-1876. 6. 1875-1876.

7. 1876-1877. 7. 1876-1877. 7. 1876-1877.

8. 1877-1878. 8. 1877-1878. 8. 1877-1878.

9. 1878-1879. 9. 1878-1879. 9. 1878-1879.

10. 1879-1880. 10. 1879-1880. 10. 1879-1880.

11. 1880-1881. 11. 1880-1881. 11. 1880-1881.

12. 1881-1882. 12. 1881-1882. 12. 1881-1882.

13. 1882-1883. 13. 1882-1883. 13. 1882-1883.

14. 1883-1884. 14. 1883-1884. 14. 1883-1884.

15. 1884-1885. 15. 1884-1885. 15. 1884-1885.



$$\begin{array}{r} 29 \overline{) 119} \\ \underline{116} \\ 3 \end{array}$$

Checking

$$\begin{array}{r} 29 \\ \times 4 \\ \hline 116 \\ 3 \\ \hline 119 \end{array}$$

Subtracting. we get 32 as remainder.  
 Comparing, we see that 32 is larger  
 than the divisor 29. So there is  
 trouble. Our rule didn't work. We  
 must increase our trial quotient by 1.  
 Using 4 a trial quotient, multiplying  
 and subtracting, we get 3 as remainder.  
 So our general plan saved us from error.  
 We must always compare. If the remainder  
is larger than or equal to the divisor,  
we must make the trial quotient 1 larger.





Do the following examples very carefully- some of them are exceptions to Rule II: some follow the rule. Watch each step, compare, and when through, check the answer.

- |                              |                    |                              |                               |
|------------------------------|--------------------|------------------------------|-------------------------------|
| a. 29)11 $\bar{5}$           | b. 29)89           | c. 29)17 $\bar{8}$           | d. 29)11 $\bar{8}$            |
| e. 29)117                    | f. 29)17 $\bar{8}$ | g. 39)79 $\bar{\phantom{0}}$ | h. 29)114                     |
| i. 37)79                     | j. 39)77           | k. 58)235                    | l. 78)710                     |
| m. 26)84 $\bar{\phantom{0}}$ | n. 39)237          | o. 49)297                    | p. 27) <u>80</u>              |
| q. 59)41 $\bar{6}$           | r. 78)70 $\bar{8}$ | s. 27)8 $\bar{8}$            | 58)230                        |
| u. 49)290                    | v. 69)555          | w. 87)840                    | x. 46)328 $\bar{\phantom{0}}$ |

On the following day, the 1st of June, the  
 ship sailed for the Cape of Good Hope, and  
 arrived there on the 10th of the same month.

On the 11th of June, the ship sailed for the Cape of Good Hope, and arrived there on the 20th of the same month.

On the 21st of June, the ship sailed for the Cape of Good Hope, and arrived there on the 30th of the same month.

On the 1st of July, the ship sailed for the Cape of Good Hope, and arrived there on the 10th of the same month.

On the 11th of July, the ship sailed for the Cape of Good Hope, and arrived there on the 20th of the same month.

On the 21st of July, the ship sailed for the Cape of Good Hope, and arrived there on the 30th of the same month.

On the 1st of August, the ship sailed for the Cape of Good Hope, and arrived there on the 10th of the same month.



Another Exception to Rule II -- Exception No. 2

This exception is so easy and simple, that it is not necessary to make much of it. But it may help you to place greater reliance in the four step plan, or six steps if you count the two extra little steps.

When you can see at a glance what an answer should be, you say you arrive at the answer by inspection. When the first two figures of the dividend are almost the same as the two-figure divisor, you see at a glance that Rule II does not apply.

Notice the following:

$$\begin{array}{r} 1 \\ 48 \overline{)49} \end{array}$$

You see that 48 will go into 49 only once. Rule II doesn't apply.

$$\begin{array}{r} 10 \\ 48 \overline{)492} \end{array}$$

You see that 48 will go into 492 10 times, with a small remainder. Finish solving these examples and prove by checking.

In the following examples, first go through and put down the quotients by inspection. Then go through and solve and prove by checking.

a.  $28 \overline{)29}$     b.  $27 \overline{)28}$     c.  $56 \overline{)59}$     d.  $39 \overline{)82}$     e.  $29 \overline{)95}$

$97 \overline{)99}$     g.  $27 \overline{)98}$     h.  $26 \overline{)33}$     i.  $69 \overline{)695}$     j.  $19 \overline{)62}$

k.  $36 \overline{)38}$     l.  $38 \overline{)80}$     m.  $28 \overline{)75}$     n.  $28 \overline{)291}$     o.  $16 \overline{)19}$

REPORT ON THE PROGRESS OF THE WORK DURING THE YEAR 1900

The following is a summary of the work done during the year 1900. The first part of the year was spent in the study of the history of the country, and the second part in the study of the present state of the country. The work was done in the following order: first, the history of the country was studied, and then the present state of the country was studied. The work was done in the following order: first, the history of the country was studied, and then the present state of the country was studied.

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Exceptions to Rule II. Exception No. 3.

When the divisor is 12, 13, 14, 15, 16, 17, or 18, neither Rule I or Rule II may apply. Rule II should apply, but it doesn't always. Use your head, follow the general plan, and prove by checking.

- a. 12)852̄    b. 17)357̄    c. 14)1038̄    d. 15)1235̄    e. 13)768̄
- f. 19)1591̄    g. 16)978̄    h. 13)6237̄    i. 18)4082̄    j. 18)6348̄
- k. 15)6500̄    l. 12)972̄    m. 14)854̄    n. 17)7390̄    o. 16)5708̄
- p. 15)9133̄    q. 16)594̄    r. 18)308̄    s. 17)2940̄    t. 15)768̄
- u. 13)777̄    v. 17)546̄    w. 16)106̄    x. 15)962̄    y. 13)847̄
- z. 13)1090̄    aa. 14)314̄    bb. 16)5555̄    cc. 17)5377̄    dd. 13)9541̄
- ee. 13)1262̄    ff. 17)10700̄    gg. 18)12965̄    hh. 18)7689̄
- ii. 15)5356̄    jj. 14)13105̄    kk. 17)16056̄    ll. 16)6018̄
- mm. 18)14855̄    nn. 18)13200̄    oo. 18)12212̄    pp. 17)12989̄
- qq. 16)10675̄





Exceptions to Rule II    Exception No. 4.

In some other cases, Rule II doesn't work, reminding us that we must always be on the lookout, and that we must always compare the remainder of every step with the divisor before going on.

a.  $36 \overline{)11107}$     b.  $29 \overline{)1102}$     c.  $285 \overline{)86324}$     d.  $47 \overline{)2397}$

e.  $268 \overline{)86747}$     f.  $28 \overline{)1149}$

Three figure divisors, when second figure is large, usually come under Rule II.

a.  $279 \overline{)4636}$     b.  $365 \overline{)93474}$     c.  $357 \overline{)12364}$     d.  $582 \overline{)16243}$

e.  $765 \overline{)432400}$     f.  $982 \overline{)834208}$

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Answers for Group I.To the Pupil:

In solving an example, always note page, group, and letter, together with any other subdivision.

You must learn to be reliable. In arithmetic this means honesty, care, and responsibility. Check yourself carefully. In case of error, find the cause, so it may not occur again.

Page 6

Dividing by 11. a. 11, b. 22, c. 33, d. 12, e. 23, f. 44, g. 333 h. 313 i. 121 j. 111 k. 122 l. 233. m. 445 n. 263 o. 233 p. 123 q. 213 r. 224 s. 326 t. \$1.25

## Dividing by 21

a. 10, b. 21, c. 14, d. \$1.12, e. 214, f. 1111 g. \$21.11 h. 1112 i. 1213, j. 1113

## Dividing by 31.

a. 11, b. 20, c. 21, d. 31, e. 111, f. 222, g. 112 h. 122, i. 3111, j. 2122,

## Dividing by 41, 51, 61, 71, 81.

a. 11, b. 1111, c. 111, d. 10, e. 111, f. \$11.12 g. 2121 h. 1211, i. 11, j. 111

## Dividing by 12, 13,

a. 10, b. \$1.31 c. \$22.22, d. 3231 e. 13 f. 20 g. \$1.21 h. 213. i. 1112 j. 33.

The first part of the paper is devoted to a general discussion of the problem. It is shown that the problem is of great importance in the theory of the subject. The second part of the paper is devoted to a detailed discussion of the problem. It is shown that the problem is of great importance in the theory of the subject.

The third part of the paper is devoted to a detailed discussion of the problem. It is shown that the problem is of great importance in the theory of the subject. The fourth part of the paper is devoted to a detailed discussion of the problem. It is shown that the problem is of great importance in the theory of the subject.

The fifth part of the paper is devoted to a detailed discussion of the problem. It is shown that the problem is of great importance in the theory of the subject. The sixth part of the paper is devoted to a detailed discussion of the problem. It is shown that the problem is of great importance in the theory of the subject.

The seventh part of the paper is devoted to a detailed discussion of the problem. It is shown that the problem is of great importance in the theory of the subject. The eighth part of the paper is devoted to a detailed discussion of the problem. It is shown that the problem is of great importance in the theory of the subject.

The ninth part of the paper is devoted to a detailed discussion of the problem. It is shown that the problem is of great importance in the theory of the subject. The tenth part of the paper is devoted to a detailed discussion of the problem. It is shown that the problem is of great importance in the theory of the subject.



Page 7

Dividing by 22.

a. 11, b. 13, c. 20, d. 30, e. 40, f. 121  
g. 112, h. 222, i. 2111, j. 1312

Dividing by 32.

a. 12, b. 30, c. 31, d. 121, e. 213, f. 212,  
g. 112, h. 2111, i. 3111, j. 1112.

Dividing by 42, 52, 62, 72, 82.

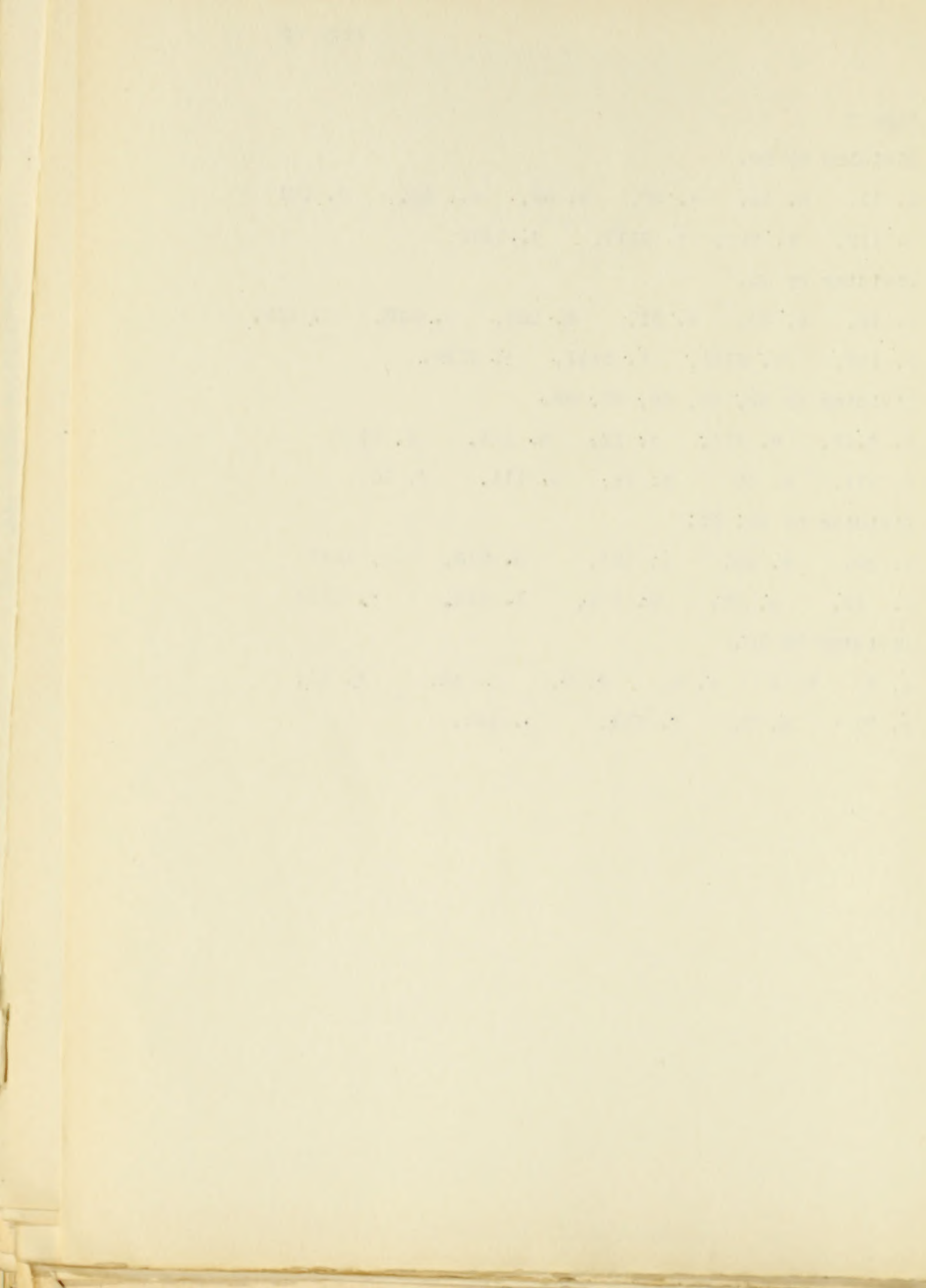
a. 11, b. 111, c. 11, d. 111, e. 11,  
f. 111, g. 10, h. 11, e. 111, j. 10

Dividing by 23, 33.

a. 10, b. 13, c. 121, d. 213, e. 1547  
f. 12, g. 20, h. 111, i. 212, j. 1112

Dividing by 10.

a. 7, b. 3, c. 5, d. 9, e. 12, f. 11,  
g. 71, h. 8, i. 111, j. 121,





Answers for Group II.Page 9

Dividing by 11.

- a. 11-1R.    b. \$.33-3R.    c. 44-4R.    d. 50-5R.    e. 62-6R.  
 f. \$2.42-4R.    g. 112-1R.    h. 132-3R.    i. 334-3R.    j. \$7.12-1R.  
 k. 134-1R.    l. 244-2R.    m. 426-2R.    n. 52-7R.    o. 418-1R.  
 p. 225-2R.    q. 125-1R.    r. 236-3R.    s. 227-2R.    t. \$1.17-1R

Dividing by 21.

- a. 10-2R.    b. 22-5R.    c. 33-5R.    d. 41-8R.    e. \$.14-5R.  
 f. 122-4R.    g. 223-4R.    h. 214-4R.    i. 314-5R.    j. \$1.14-4R.

Dividing by 31.

- a. 11-4R.    B. 12-5R.    c. 20-2R.    d. 21-4R.    e. 30-3R.  
 f. \$.32-5R.    g. 111-1R.    h. 222-5R.    i. 112-3R.    j. 122-6R.

Dividing by 41, 51, 61, 71, 81.

- a. 10-9R.    b. 12-3R.    c. 21-5R.    d. 111-8R.    e. \$2.12-6R.  
 f. 11-3R.    g. 11-3R.    h. \$1.11-6R.    i. 10-2R.    j. 111-5R.

Dividing by 12, 13,

- a. 11-1R.    b. 22-3R.    c. 33-2R.    d. \$41-6R.    e. 121-2R  
 f. 232-3R.    g. \$83.14-1R.    h. 12-1R.    i. 111-2R.    j. \$1.21-2R.

Dividing by 22.

- a. 11-4R.    b. \$13-3R.    c. 22-3R.    d. 31-7R.    e. 40-8R.  
 f. 121-1R.    g. 222-4R.    h. \$2.13-2R.    i. 313-1R.    j. 113-1R.





Answers for Group II

Page 10

Dividing by 32.

- a. 10-4R. b. 11-4R. c. \$.12-3R. d. 30-9R. e. 31-7R.  
f. 111-2R. g. 121-6R. h. 213-1R. i. 212-1R. j. 112-5R.

Dividing by 42, 52, 62, 72.

- a. 11-4R. b. 111-6R. c. 11-2R. d. 11-4R. e. 111-2R.  
f. 11-6R. g. \$1.11-5R. h. 11-3R. i. 11-5R. j. 11-5R

Dividing by 23, 33, 53, 63.

- a. 11-11R. b. 11-4R. c. 21-12R. d. \$.12-11R. e. \$.11-1R.  
f. 21-2R. g. 12-1R. h. 112-1R. i. 11-2R. j. 11-3R.

Dividing by 10

- a. 11-2R. b. 6-4R. c. 12-5R. d. 135-2R. e. 17-5R.  
f. 9-6R. g. 45-2R. h. 68-7R. i. 4-8R. j. 96-5R.

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

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10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10



Answers for Group IIIPage 12

a. 21 b. 22-5R. c. 32-6R. d. 21-13R. e. 42-5R.  
f. 12-13R. g. 32-3R. h. 63-1R. i. 22-10R. j. 45-1R.  
k. 33-13R. l. 522-13R. m. 32-3R. n. 22-25R. o. 211-30R.  
p. 368-11R. q. \$. 52 r. 878-6R. s. 33-23R. T. 249-20R.  
u. 211-15R. v. 51-3R. w. 61-4R. x. 47-2R. y. 31-7R.  
z. 62 aa. 21 bb. \$.61 cc. \$. 51 dd. \$.32  
ee. \$6.13 ff. 53 gg. 24 hh. 23 ii. 33





Answers for Group IVPage 13

a. 52-21R.      b. 33-13R.      c. 82-15R.      d. 54-23R.  
 e. 43      f. 45-18R.      g. 44-26R.      h. 27-16R.      i. 23-12R.  
 j. 24-11R.      k. 25-16R.      l. 74-7R.      m. 52-32R.      n. 541-26R  
 o. 544-27R.      p. 56      q. 83      r. 62      s. 83      t. 75  
 u. 62-14R.      v. 77      w. 35-22R.      x. 24-12R.

Answers for Group V.Page 14.

a. 41      b. 141      c. 32-25R.      d. 61-21R.      e. 84      f. 17  
 g. 44      h. 21      i. 33      j. 12      k. 31      l. 321-29R.  
 m. 85-6R.      n. 22      o. 32-3R.      p. 31-38R.      q. 53-58R.  
 r. 32-7R.      s. 111-30R.      t. 212-8R.      u. 45-17R.

Answers for Group VIPage 15

a. 42      b. 16      c. 41-7R.      d. 55-6R.      e. 42-14R.      f. 325-61  
 g. 81      h. 65      i. 63      j. 33-6R.      k. 373-69R.      l. 25-7R  
 m. 26      n. 635-62R.      o. 33-2R.      p. 64-29R.      q. 61-10R.  
 r. 545-16R.      s. 426      t. 42-4R.      u. 33-13R.      v. 31-57R.  
 w. 45-1R.      x. 335-9R.

*If the dividend is changed, the answer should be 72-22R.*





Answers for Group VIIPage 16

a. 21.      b. 22      c. 32      d. 12-21R.      e. 221-4R.      f. 23-13R.  
 g. 23-13R.      h. 31-133R.      i. 22-11R.      j. 21-10R.  
 k. 334-142R.      l. 224-119R.      m. 23-27R.      n. 212-14R.  
 o. 21      p. 31-105R.      q. 24-10R.      r. 232-14R.      s. 421-134R.  
 t. 121-24R.      u. 14      v. 21-122R.      w. 4      x. 27  
 y. 45-52R.      z. 4-85R.      aa. 4      bb. 67-90R.

Answers for Group VIIIPage 17.

a. 832      b. 317-31R.      c. 335-20R.      d. 522-178      e. 33-5R.  
 f. 332-32R.      g. 31-46R.      h. 3132-60R.      i. 342-16R.  
 j. 372-312R.      k. 117-16R.      l. 273-54R.      m. 734-2R.  
 n. 411-4R.      o. 131-6R.      p. \$8.31-58      q. 644      r. 16-432R.  
 s. 53-12R.      t. 92-412R.

Answers for Group IXPage 19

a. 101-31R.      b. 103-1R.      c. 1023-55R.      d. 208-19R.  
 e. 105-92R.      f. 236-61R.      g. 1099-242R.      h. 208-10R.  
 i. 503-158R.      j. 360      k. 106-11R.      l. 190      m. 420-23R.  
 n. 307-33R.      o. 603-68R.      p. 303-3R.      q. 402-256R.      r. 102-10R.  
 s. 40-80R.      t. 605-53R.      u. 306-13R.      v. 250-13R.





Answers. Exceptions to Rule I.

a. 1-19R.    b. 1-20R.    c. 1-18R.    d. 19 <sup>19-12R</sup> e. 1-22R.    f. 1-22R <sup>18-4R</sup>  
 g. 18 <sup>h</sup> h. 19-10R.    i. 19-3R.    j. 19-10R <sup>L</sup> k. 19-11R.  
 l. 18-8R.    m. 1-40R.    n. 29 <sup>o</sup> p. 20 <sup>q</sup> q. 39-40R.    r. 49 <sup>r</sup>  
 s. 19-40R.    t. 59-3R.    u. 19-2R.    v. 79 <sup>w</sup> w. 19-70R.  
 x. 19-71R.    y. 18-12R.    z. 17.

Estimating Answers.

Frequently an estimated answer is as good as an exact answer. For instance, I am planning an auto trip from Boston to Indianapolis. The distance is 963 miles. How many hours will it take to make the trip if I average 40 miles an hour?

The answer is about 24 hours. But if the traffic is heavy or if I go through many large cities, I know an average of 40 miles an hour will not be possible. So 25 or 26, or even 30, is as likely to be as correct as 24.

How many days will it take me? Now that also depends. If I go alone, I could doubtless make the drive in 2 days. But if I take the family, including two children, two and five year's old, it will surely take 3 or 3½ days.

In these cases estimating is as good as exact figuring. You must learn to estimate. It enables one to have the aid of numbers in thinking, when pencil and paper are not at hand.





## RULE II

ANSWERSPage 23

a. 324, b. 217-19R, c. 248-4R, d. 3757-16R, e. 483, f. 17-38R,  
 g. 354-40R, h. 18-9R, i. 18-22R, j. 44-22R, k. 4-18R, l. 7-17R,  
 m. 473-65R, n. 44-2R, o. 121-41R, p. 233-6R, q. 3-22R, r. 3-5R,  
 s. 3-11R, t. 7-7R, u. 3-20R, v. 4-13R, w. 5-20R, x. 7-16R,  
 y. 4-10R, z. 3-12R, aa. 5-11R, bb. 7-21R.

Page 24

a. 8-19R, b. 31-28R, c. 21-53R, d. 65-10R, e. 8-32R, f. 21-23R,  
 g. 65-15R, h. 20-30R, i. 21-37R.

Page 24.

a. 74-24R, b. 225-15R, c. 331-5R, d. 214-27R, e. 349-17R,  
 f. 277-12R, g. 5-12R, h. 4-7R, i. 3-8R, j. 10-33R, k. 15-10R,  
 l. 97-22R, m. 31-26R, n. 62-12R, o. 737-6, p. 497-3R.

Page 25.

a. 125-27R, b. 144-9R, c. 207-12R, d. 31-57R, e. 31-21R, f. 32-44R,  
 g. 73-25R, h. 79-1R, i. 218-91R, j. 351-51R, k. 32-12R, l. 32-54R,  
 m. 63-50R, n. 61-65R, o. 563-80R, p. 221-21R, q. 408-23R,  
 r. 638-8R, s. 434-20R, t. 640-39R.

Exceptions to Rule IIException No. 1. Page 27

a. 4, b. 3-2R, c. 6-4R, d. 4-2R, e. 4-1R, f. 6-4R, g. 2-1R,  
 h. 3-27R, i. 2-5R, j. 1-38R, k. 4-3R, l. 9-8R, m. 3-6R, n. 6-3R,  
 o. 6-3R, p. 2-26R, q. 7-3R, r. 9-6R, s. 3-7R, t. 3-56R,  
 u. 5-45R, v. 8-3R, w. 9-57R, x. 7-6R.





ANSWERSExceptions to Rule II

Exception No. 2.

Page 28.

a. 1-1R, b. 1-1R, c. 1-3R, d. 2-4R, e. 3-8R, f. 1-2R, g. 3-17R,  
 h. 1-7R, i. 10-5R, j. 3-5R, k. 1-2R, l. 2-4R, m. 2-19R,  
 n. 10-11R, o. 1-3R.

Exceptions No. 3

Page 29

a. 69-4R, b. 50-7R, c. 77-10R, d. 82-5R, e. 59-1R, f. 83-14R,  
 g. 61-2R, h. 479-10R, i. 226-14R, j. 352-12R, k. 433-5R, l. 81,  
 m. 61, n. 434-12R, o. 356-12R, p. 608-13R, q. 37-2R, r. 17-2R,  
 s. 172-16R, t. 51-1R, u. 59-10R, v. 32-2R, w. 6-10R, x. 64-2R,  
 y. 65-2R, z. 83-11, aa. 58-2R, bb. 347-3R, cc. 316-5R, dd. 733-12R,  
 ee. 97-1, ff. 629-7R, gg. 720-5R, hh. 426-1R, ii. 357-1R, jj. 936-1R,  
 kk. 944-8R, ll. 376-2R, mm. 825-5R, nn. 733-6R, oo. 678-8R,  
 pp. 764-1R, qq. 667-3R.

Exception No. 4 Page 30

a. 308-19R, b. 38, c. 302-254R, d. 51, e. 323-183R, f. 41-1R,

a. 16-172R, b. 256-34R, c. 36-12R, d. 27-529R, e. 565-175R,  
 f. 849-490R.





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